

[54] TAMPER-PROOF CONTAINER

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215/320

[58] Field of Search ..... 215/253, 256, 252;  
220/276, 270, 320

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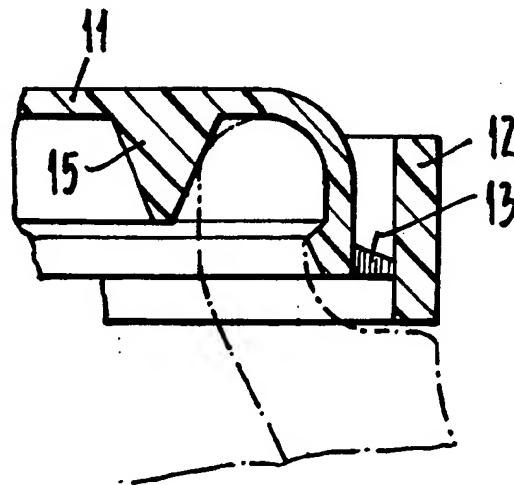
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Primary Examiner—Herbert F. Ross  
Attorney, Agent, or Firm—Wigman & Cohen

[57] ABSTRACT

A tamper-proof container closure which has a tear strip concentric with the dependent side walls of the cap. The tear strip which is spaced apart from the cap side walls is connected to the side walls by frangible radial connections. The tear strip is adapted to seat on a shoulder of the container on which the cap is fitted and the closure can only be removed from the container by first removing the tear strip.

3 Claims, 6 Drawing Figures



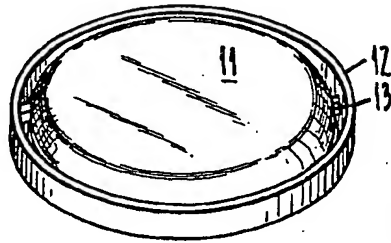


FIG. 1.

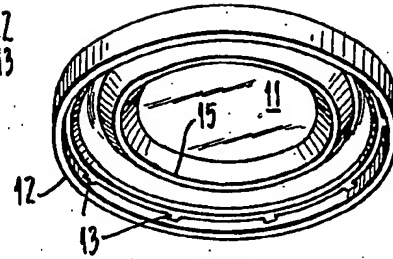


FIG. 2.

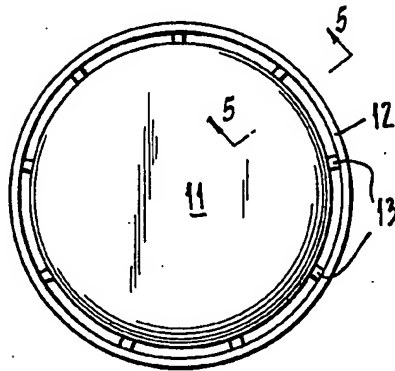


FIG. 3.

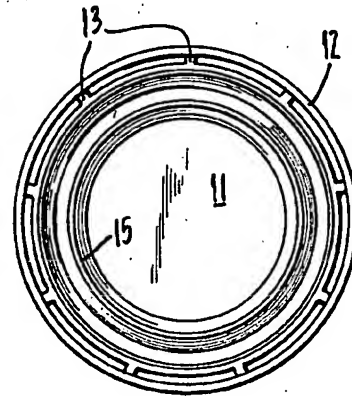


FIG. 4.

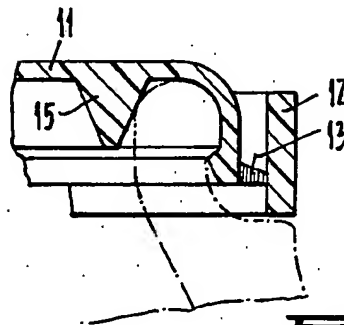


FIG. 5.

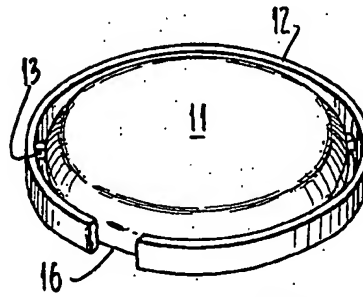


FIG. 6.

## TAMPER-PROOF CONTAINER

This invention relates to tamper-proof closures for containers, particularly for plastic containers for liquid foodstuffs.

Tamper-proof closures are required to ensure that consumers can readily identify if the closure or cap of a container has been opened. Generally, such closures cannot be removed from the container unless a portion of the cap is torn or removed. Prior designs of tamper-proof caps, although achieving the above objects, have proved difficult to use insofar as positioning the cap onto the container is concerned. Also, prior art tamper-proof closures have tended to be complex in shape so that expensive production methods were involved in producing them.

It is an object of this invention to provide a simple closure for containers which can be applied by conventional cap applicators and produces by simple injection moulding techniques.

To this end, the present invention provides a tamper-proof container comprising a container body having a neck portion, said neck portion incorporating an opening, a peripheral lip about said opening, a recessed portion below said lip, and a shoulder portion forming the base of said recess and extending beyond the extremity of said lip; and a closure for said container body comprising a top portion adapted to cover said opening, a first dependent side wall portion adapted to extend over said lip, a beading on said side wall portions adapted to seat in said recess and a second wall portion detachably secured to said first side wall, spaced therefrom and concentric therewith, said second wall portion seating on said shoulder portion. The container closure is a snap fit onto the container. The presence of the outer wall portion seated on the shoulder of the container renders it impossible to remove the closure without rupturing the severable connections between the dependent side wall and the outer wall portion. Generally, the connection can be broken by flexing the outer wall portion.

One advantage of this invention is that the cap can be applied as a snap-on cap on lightweight plastic bottles using a so-called "Ford Capping Station" that is standard on many conventional high speed rotary dairy and juice filling lines where an aluminum foil cap is usually applied. The relatively simple design of the closures of the present invention makes the production costs therefore less than other alternatives known in the art.

Another advantage of the cap design of this invention is that the caps do not nest within one another during automatic feeding of the caps prior to their being placed onto the filled bottles. If nesting occurs, difficulty is encountered in separating the caps and this can lead to loss of production time during the filling of the bottles.

A preferred form of the invention is shown in the attached drawings.

FIG. 1 is a perspective view from above of a closure cap for a plastic cream bottle.

FIG. 2 is a perspective view from below of such a cap.

FIG. 3 is a plan view of the closure cap from above.

FIG. 4 is an underneath plan view of the cap.

FIG. 5 is an enlarged cross sectional view of the cap attached to a container (which is shown by dotted lines); and

FIG. 6 is a perspective view of a variation to the present invention.

The closure 11 includes a top portion and a dependent side wall portion and an outer wall portion 12 connected to the side wall portion by severable connecting links 13.

The closure 11 incorporates a flange 15 dependent from its top portion and concentric with the first side wall portion such that the lip of the opening of the container to which closure 11 is applied is wedged between the flange 15 and the first dependent wall portion.

The side wall portion of the closure 11 also includes an internal beading which seats below the corresponding lip portion of the container. The outer wall 12 seats on the outer periphery of the corresponding shoulder of the container as shown in FIG. 5.

In FIG. 6, the outer wall 12 is discontinuous due to gap 16 which enables the wall strip 12 to be grasped and removed from the closure so that the closure 11 can be removed from the container. The connecting links can be severed by engaging the upper edge of the wall portion 12 and flexing downwards. Standard cap applicators can be used to fit the caps to the containers and a specially designed applicator is not required.

From the above, it can be seen that the present invention provides a unique tamper-proof closure which is simple in design and easy to apply while providing the security of being non-removeable without severing the connection between the outer wall and the side wall of the closure.

I claim:

1. A tamper-proof container comprising a container body having a neck portion, said neck portion incorporating an opening, a peripheral lip about said opening, a recessed portion below said lip and a shoulder portion forming the base of said recess and extending beyond the extremity of said lip; and a closure for said container body comprising a top portion adapted to cover said opening, a first dependent side wall portion adapted to extend over said lip, a flange dependent from said top portion and concentric with and radially spaced from said first wall portion such that said lip of said opening of said container is wedged between said flange and said first dependent wall portion, a beading on said sidewall portions adapted to seat in said recess and a second wall substantially encircling said first wall and having a portion detachably secured to said first side wall, radially spaced therefrom and concentric therewith, said second wall portion seating on said shoulder portion.

2. A container as claimed in claim 1, in which said second wall portion is discontinuous.

3. A closure for use with a tamper-proof container having a body with a neck portion, said neck portion incorporating an opening, a peripheral lip about said opening, a recessed portion below said lip and a shoulder portion forming the base of said recess and extending beyond the extremity of said lip; said closure comprising a top portion adapted to cover said opening, a first dependent side wall portion adapted to extend over said lip, a flange dependent from said top portion and concentric with and radially spaced from said first wall portion such that said lip of said opening of said container is wedged between said flange and said first dependent wall portion, a beading on said sidewall portions adapted to seat in said recess and a second wall substantially encircling said first wall and having a portion detachably secured to said first side wall, radially spaced therefrom and concentric therewith, said second wall portion seating on said shoulder portion.

\* \* \* \* \*



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**United States Patent** [19]

Bösl et al.

[11] **Patent Number:** **6,116,444**[45] **Date of Patent:** **Sep. 12, 2000**[54] **PLASTIC CLOSURE CAP**[75] Inventors: **Udo Bösl**, Eimeldingen; **Michael Kirchgessner**, Egringen, both of Germany[73] Assignee: **Crown Cork AG**, Reinach, Switzerland[21] Appl. No.: **08/981,047**[22] PCT Filed: **Jun. 4, 1996**[86] PCT No.: **PCT/CH96/00211**§ 371 Date: **Feb. 23, 1998**§ 102(e) Date: **Feb. 23, 1998**[87] PCT Pub. No.: **WO97/00210**PCT Pub. Date: **Jan. 3, 1997**[30] **Foreign Application Priority Data**

Jun. 15, 1995 [CH] Switzerland ..... 1769/95

[51] Int. Cl.<sup>7</sup> ..... **B65D 39/00**[52] U.S. Cl. .... **215/253; 215/275; 215/305**[58] Field of Search ..... **215/253, 295, 215/305**[56] **References Cited****U.S. PATENT DOCUMENTS**

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*Primary Examiner*—Stephen K. Cronin  
*Attorney, Agent, or Firm*—Woodcock Washburn Kurtz  
 Mackiewicz & Norris LLP

[57] **ABSTRACT**

A closure cap for closure of containers possesses a closure base (2), a wall (3), and a pull-off ring (7). The pull-off ring is connected to the wall (3) at connecting points (8). In order to open the closure cap, a force is exerted onto the pull-off ring (7), by which means two vertical frangible lines (9) lying adjacent to the connecting points (8) will be destroyed. As a result, an area of the wall (3) can be bent outwards and opening of the closure cap will be facilitated.

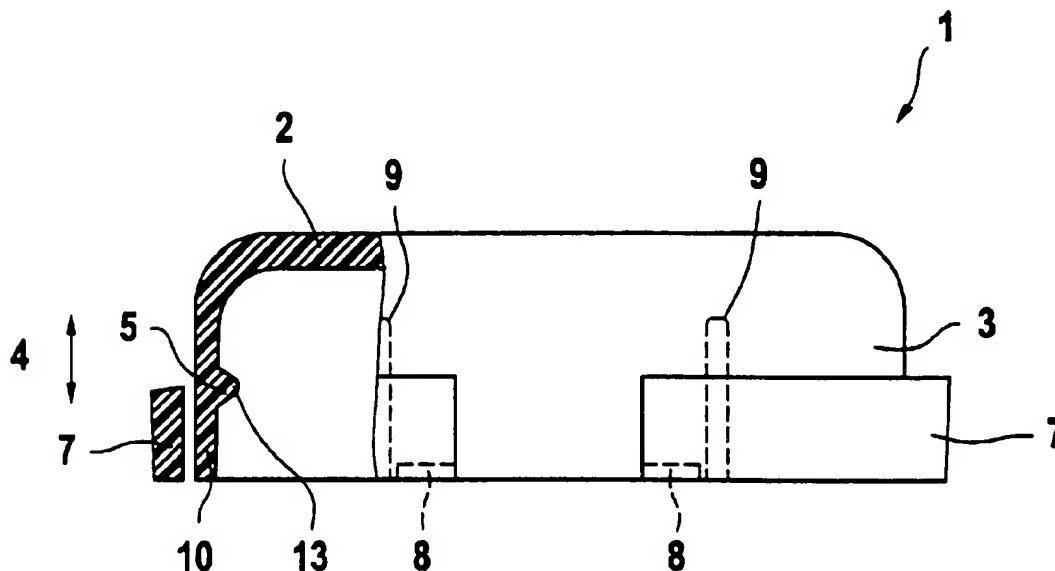
**10 Claims, 4 Drawing Sheets**



Fig. 1

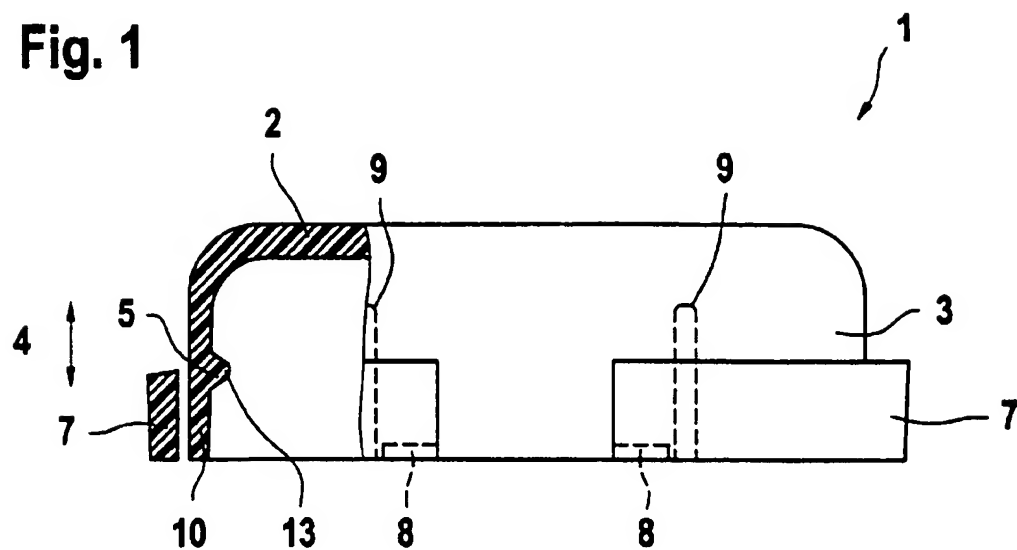
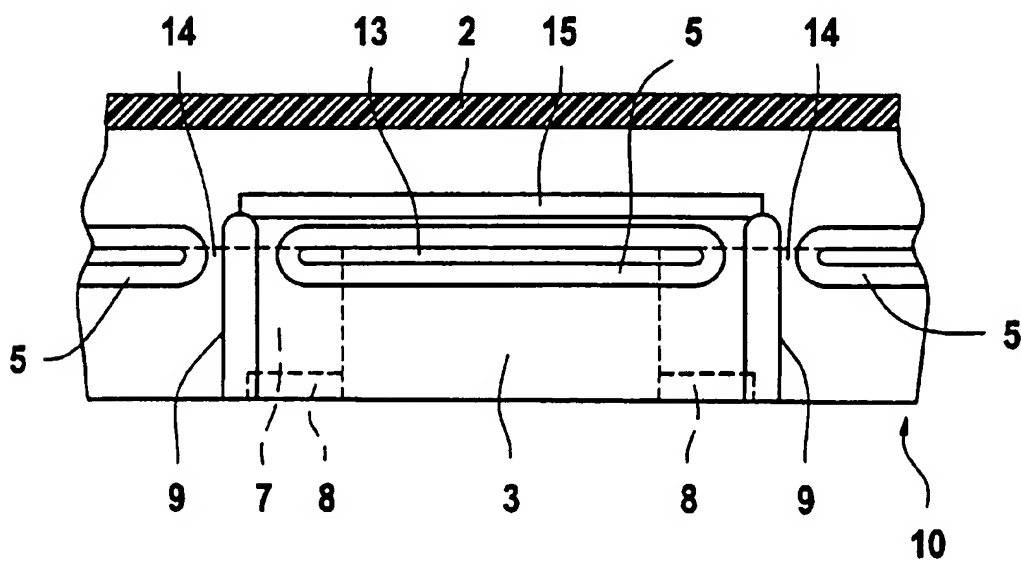
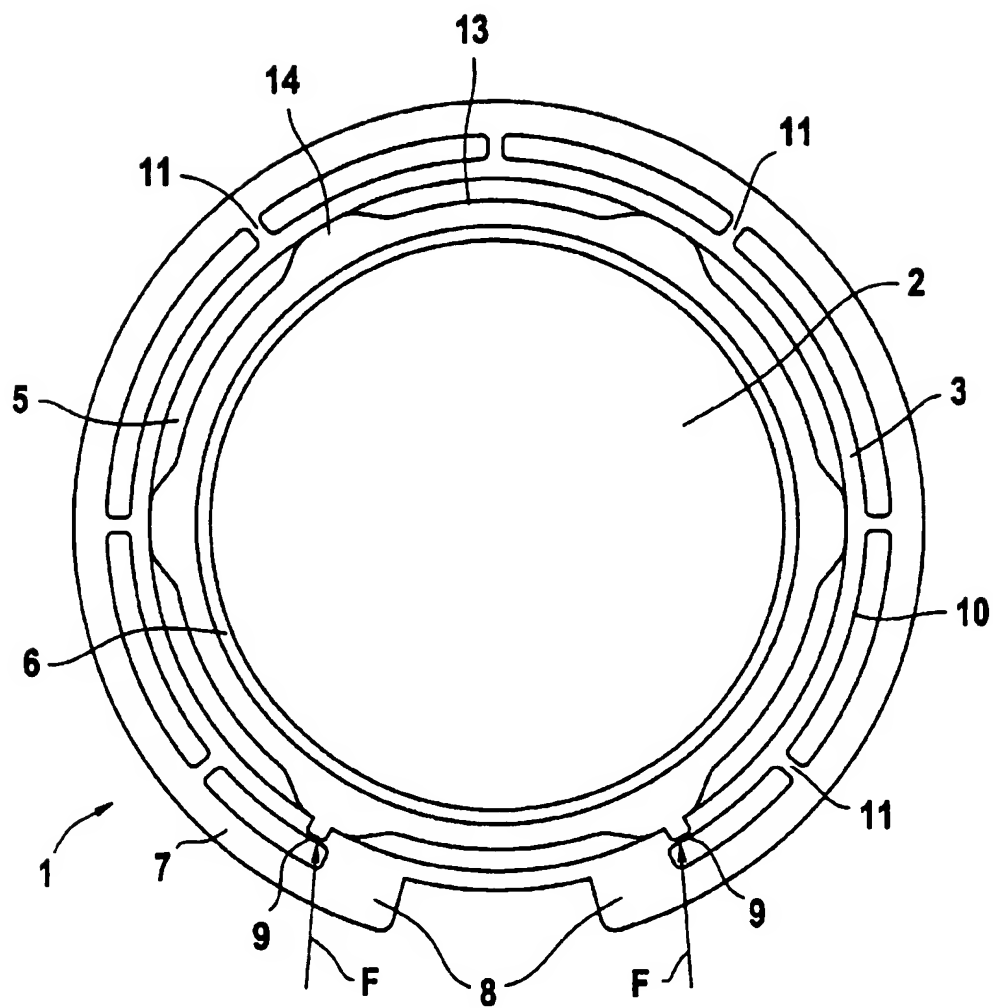
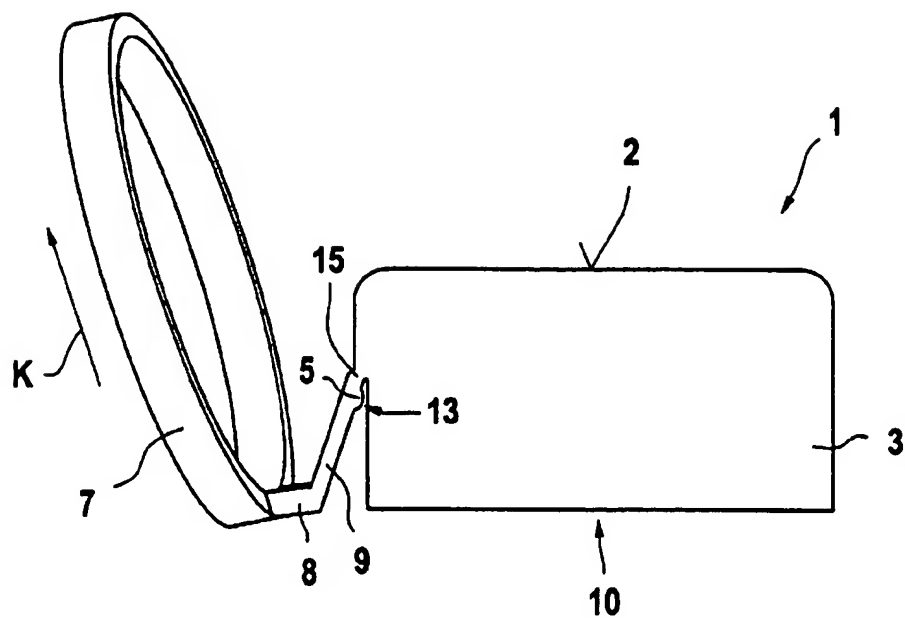


Fig. 2

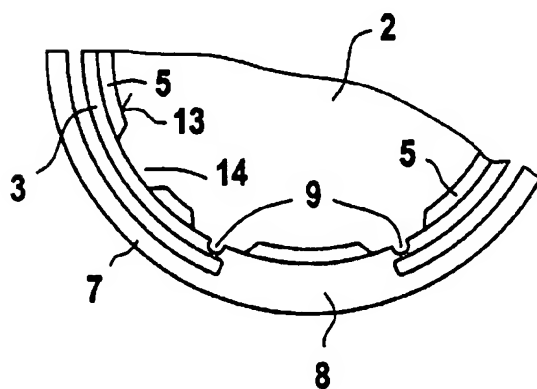


**Fig. 3**

**Fig. 4**



**Fig. 5**



**Fig. 6**

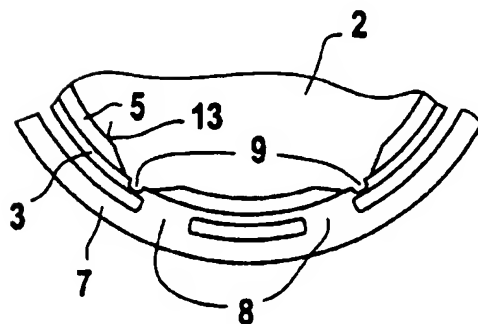


Fig. 7

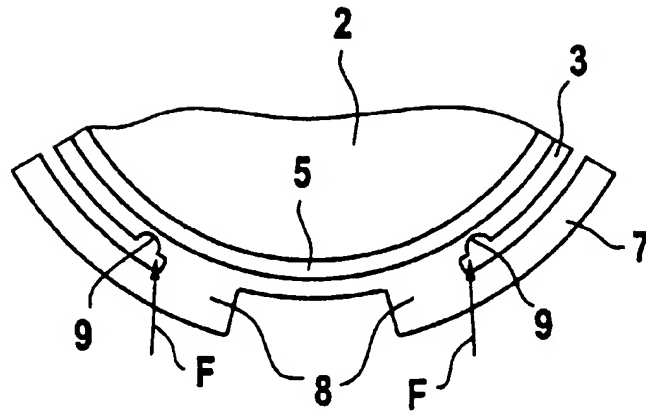


Fig. 8

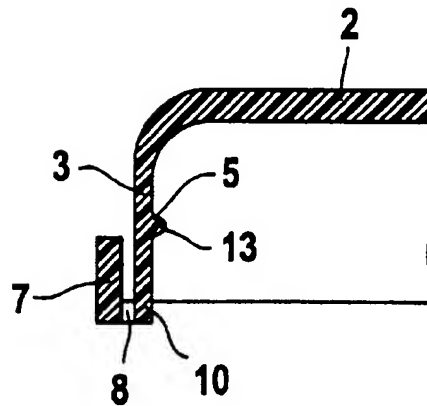
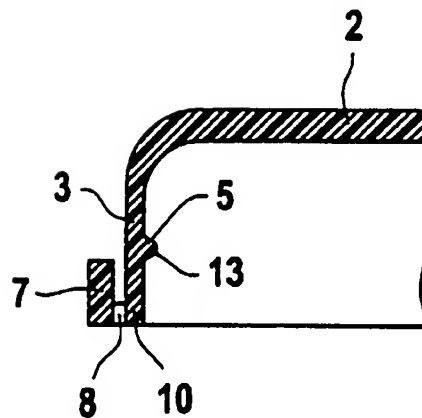


Fig. 9



## PLASTIC CLOSURE CAP

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

The invention concerns a plastic closure cap according to the preamble to claim 1. These types of closure caps are mainly used for the closure of containers, and in particular of bottles with liquid contents.

## 2. Description of Related Art

If the closure cap is used on containers with beverages containing carbon dioxide, the closure cap must under certain conditions also remain reliably in contact with the container mouth under considerable gas pressure. For this reason, retaining means are anticipated on the container mouth and on the inner side of the closure cap by which means the closure cap can engage with the container mouth. As a result, however, intentional manual removal of the closure cap will also be hindered. In order to solve this problem, various suggestions are known.

For example, CH-PS-529 022 shows a plastic closure cap provided with a strap engaging around the outer wall, by which means the closure cap can be withdrawn from the container mouth under the exertion of force.

CH-PS-553 696 shows a closure cap which, on its casing, is provided with a press lug and frangible points. The closure cap can be removed by means of depressing the press lug. Through the exertion of pressure on the press lug, the frangible points will sever, permitting the retention element to be overcome more easily. Apart from that, severed frangible points will reveal unauthorized opening of the container.

DE-DO-1 782 059 shows a plastic closure cap which is provided with a pull-off ring and integrated zones of weakness on the cap casing. If, in order to open the closure, a force is applied to the pull-off ring, the said zones of weakness will break, by which means opening of the closure cap will be facilitated. The closure cap retaining elements possess additional sections of less thickness and if necessary also perforations, in order to impart increased flexibility to the cap.

However, all these closure caps suffer various disadvantages: either considerable force will still be required in order to open the cap, or the closure is so elastic that it can easily be ejected from the container mouth by the internal pressure. On the one hand, with solutions that recommend press elements or press lugs, the disadvantage is that only a relatively short lever arm can be created; on the other hand, the zones of weakness on the lower skirt edge are restricted, so that breaking of these zones of weakness will not facilitate opening to any degree.

The object of the invention is thus to avoid the disadvantages of the state of the art, and therefore, in particular, to create a plastic closure cap for beverages containing CO<sub>2</sub> which can be removed from the container mouth with the least possible application of force. In addition, the closure cap shall also display initial opening of the container.

## BRIEF SUMMARY OF THE INVENTION

According to the invention, this object is primarily fulfilled according to the characterizing section of claim 1.

The closure cap possesses a cap base and a cylindrical wall connected to said base. A retaining bead is provided on the inside of the cylindrical wall, said retaining bead being able to be brought into engagement with the retaining elements in the area of the container mouth. In order to open

the closure cap, a pull-off ring is provided, said ring being connected to the edge area of the wall at at least one, preferably however two connecting points, said edge area being able to be placed upon the container opening. The pull-off ring runs concentrically to and surrounds the wall, and can be continuous or also open ended. In order to facilitate the opening procedure of the closure cap, the wall is provided with frangible lines. These frangible lines run vertically from the edge area of the wall upwards towards the closure base, and are arranged adjacently to the connecting points between the pull-off ring and the wall.

In order to open the closure cap, the pull-off ring is bent upwards and, with a pull of the finger, a force is exerted onto the connecting points between the pull-off ring and the wall. Through the proximity to the frangible lines, and by means of the connection in the edge area of the wall, the pull-off ring is connected in an optimal way to the wall. As a result, the force applied to the closure cap in order to open it can be exploited to the maximum. The opening force is directly applied to the frangible lines by the pull-off ring, by which means said frangible lines can tear open easily. The closure cap can then be removed with a slight application of force.

An additional reduction of the applied force required to open is attained in that the frangible lines are led approximately vertically from the edge area of the wall to beyond the innermost point of the retaining bead. When the frangible lines tear open, as a result a portion of the retaining bead will break away, and will no longer be in engagement with the container mouth retaining elements. Additionally, torn frangible lines will display prior opening of the closure cap, and will thus have the anti-tamper function of assuring originality.

In a particularly preferred embodiment, the pull-off ring is connected to the wall at two connecting points. By means of such a construction, the force imparted onto the closure cap by the pull-off ring will take effect exactly on the frangible lines, said frangible lines being arranged adjacent to both these connecting points.

In a further preferred embodiment, the pull-off ring, notwithstanding the fixed connecting points, is additionally connected with one or more frangible bridges to the edge area of the wall. As a result, the pull-off ring will be held in position. For example, during transport, interlocking and fouling of the pull-off ring and inadvertent opening of the closure will be avoided. On the other hand, such frangible bridges will also serve as assurance of originality. In order to open the closure cap, the pull-off ring must be separated from the wall and pulled upwards.

The pull-off ring can be formed as an open-ended ring, extending as an annular sector from one connecting point to another around the wall. As a result of the pull-off ring terminating in the area of the connecting points, an optimal transfer of the force from the pull-off ring onto the wall will be attained. However, a ring formed to be continuous will also be advantageous, said ring being connected to the wall by one or more connecting points. Also, with such a continuous pull-off ring, mainly the risk of interlocking and fouling of the closure caps of a plurality of containers will also be reduced.

Preferably, the retaining bead running around the inside of the wall possesses one or more vertical interruptions. The retaining bead is thus divided into a plurality of sections, and this imparts an additional flexibility to the closure cap. This is primarily advantageous during the opening procedure. Preferably, two of the said interruptions are arranged in such a way that the vertical frangible lines cross the retaining

bead in the area of the interruptions. If, on opening of the closure, the wall is torn open in the area lying between the frangible lines, a segment of the wall will be folded upwards, said segment carrying a section of the retaining bead. This section is thus no longer in engagement with the retaining elements of the container, by which means there will be a clear reduction in the force required to open the closure.

The vertical frangible lines can be applied to both the inside and the outside of the wall. With that, the frangible lines are preferably designed as weaknesses in the wall material.

In a further embodiment, a horizontal hinge is arranged in the wall above the frangible lines, said hinge running between the frangible lines arranged adjacent to the connecting point or points. As a result, folding up of the wall area between frangible lines will be facilitated, said area preferably containing a section of the retaining bead. The hinge can take the form of a weakening of the material. With that, the wall must be formed to be thicker in the area of the hinge than in the area of the frangible lines so that, on opening, the entire wall segment is not torn out of the wall.

A closure cap with optimal properties will result if the aforesaid embodiments are also provided with sealing elements in the area of the closure cap base and/or the wall. As sealing elements, sealing lips running concentrically to the wall are suitable, said sealing lips resting against the inner or outer surface of the container mouth.

The invention is more closely described using the following embodiments and with the aid of the drawings: namely,

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 a side view of a closure cap according to the invention, with a partial cross section,

FIG. 2 a view of the wall section seen at an enlarged scale from within the closure cap,

FIG. 3 a closure cap from below,

FIG. 4 a schematic representation of a closure cap during the opening procedure,

FIGS. 5 to 7 views from below of related embodiments of the invention, and

FIGS. 8 and 9 a cross section of a closure cap section in the area of the connecting points.

#### DETAILED DESCRIPTION OF THE INVENTION

According to FIG. 1, a closure cap possesses a circular disc-shaped closure base 2 and a cylindrical wall 3 abutting the edge of said closure base 2. In an attachment area 4, the wall 3 is provided with a means of attaching the closure cap 1 to a container mouth. A retaining bead 5 serves as an attachment means, said retaining bead being annular and pointing radially inwards, and running around the inside of the wall 3. On its surface lying at the radially innermost point, the retaining bead 5 possesses a retaining area 13, said retaining area engaging with the retaining elements of the container mouth.

A pull-off ring 7 is connected at two connecting points 8 to the edge area 10 of the wall 3, said edge area oriented away from the closure base 2. The pull-off ring 7 is not completely continuous, and runs around the wall concentrically to said wall, and thus extends around an annular sector of preferably at least 270°. This means that both the connecting points 8 are arranged on the wall adjacent to one another. Apart from that, frangible lines 9 are provided in the

wall 3, said frangible lines extending from the edge section 10 of the wall 3 approximately vertically towards the closure base 2 and beyond the retaining area 13 of the retaining bead 5. The frangible lines 9 are arranged adjacently to the connecting points 8 so that the force imparted by the pull-off ring 7 on opening the closure cap 1 is transferred onto the wall 3 in the area of the frangible lines 9 in an optimal way. In order to open the closure cap 1, the pull-off ring 7 is pulled upwards and rotated about the connecting points 8 in such a way that the wall 3 is no longer surrounded by the pull-off ring 7. By exerting a pulling force onto the pull-off ring 7, both frangible lines 9 will be destroyed and an area of the wall 3 will be released. The closure cap 1 is now no longer engaged with the entire retaining bead 5 with the retaining elements in the area of the container mouth, and can thus easily be removed.

In FIG. 2, it can be seen how the wall 3 of the closure cap 1 of a particular embodiment is constructed in the area of both connecting points. The pull-off ring 7 and both the connecting points 8 lie on the outside of the wall and are suggested in FIG. 2. Both the connecting points 8 lie in the area between the outer defining lines of both frangible lines 9. In order to optimise the transfer of force from the pull-off ring 7 to the frangible lines 9, the connecting points 8 can extend over the inner defining lines of the frangible lines 9 into the area of the frangible lines 9. Although only shown in FIG. 2, such an arrangement is advantageous for all other embodiments.

The retaining bead 5 is divided up by interruptions 14 in this embodiment, by which means individual sections of the retaining bead 5 will result. One section lies in the area of the wall that is defined by both the frangible lines 9. Both the frangible lines 9 commence in the edge area 10 of the wall 3 and extend vertically upwards and beyond the retaining area 13 of the retaining bead 5. In order to increase the flexibility of the area formed by both the vertical frangible lines, a hinge 15 running horizontally is provided in the wall 3 at the end of the frangible lines 9. The hinge 15 is formed as a slight weakening of the material in the wall 3. On opening the closure, the area defined by both the vertical frangible lines 9 is broken away from the wall 3 and can be easily folded around the hinge 15, as shown in FIG. 4.

FIG. 3 shows a view of an embodiment of a closure cap 1 with which, additional to the firm connections at the connecting points 8, the pull-off ring 7 is connected to the wall at its edge area 10 by means of frangible bridges 11. A sealing element in the form of a sealing lip 6 running concentrically to the wall 3 is arranged on the closure base 2. The vertical frangible lines are formed as a thinning of the material on the inside of the wall 3. Both the arrows F signify where the force is imparted to the wall 3 if the closure cap 1 is opened by pulling on the pull-off ring 7.

FIG. 4 shows how a closure cap 1 is opened by pulling the pull-off ring 7 in the direction K. With that, the pull-off ring 7 becomes gently bent in the area of the connecting points 8 and the portion of the wall 3 lying between two vertical frangible lines 9 is folded outwards. The hinge 15, provided between both the vertical frangible lines 9 and running horizontally on the wall, facilitates the bending over of the area torn out of the wall 3. The frangible lines 9 run towards the closure base sufficiently far that a section of the retaining bead 5 or at least of the retaining area 13 is contained in the area folded out of the wall 3.

FIG. 5 shows a further embodiment of a closure cap with which the pull-off ring 3 forms a continuous ring. The ring is connected to the edge area 10 of the wall 3 at a single

5

connecting point 8. Both the vertical frangible lines 9 are arranged to border on the connecting point 8 and formed as a thinning of the wall 3 on its inside. The retaining bead 5 is divided into a plurality of sections by interruptions 14.

FIG. 6 shows a closure cap that differs from the embodiment shown in FIG. 5 in that the continuous pull-off ring 7 is connected by two connecting points 8 to the edge area 10 of the wall 3.

FIG. 7 shows an embodiment with which the vertical frangible lines 9 are formed as a thinning of the wall 3 on its outside, and with which the retaining bead 5 runs uniformly. The two arrows F indicate how the force, exerted from the pull-off ring 7 onto the wall 3 when tearing off the closure cap 1, acts upon the area of the frangible lines 9.

FIGS. 8 and 9 show possible designs for the connecting points 8. FIG. 8 shows connecting points 8 which extend from the edge area 10 of the wall 3 downwards. The pull-off ring 7 is as a result arranged somewhat below the wall 3. On the inside of the wall 3, the retaining area 13 of the retaining bead 5 is shown.

The pull-off ring 7 can, however, also be connected to the wall 3 with connecting points 8, said connecting points extending horizontally and radially outwards from the edge area 10 of the wall 3. In the embodiment according to FIG. 9, the lower edge of the pull-off ring 7 thus lies in the same plane as the edge area 10 of the wall 3. In FIGS. 8 and 9, it can also be seen that the axial stretching of the pull-off ring 7 must be kept small in relation to the axial stretching of the wall 3. The less the stretching of the pull-off ring 7, the better that the force applied to the pull-off ring 7 will be transferred to the vertical frangible lines.

We claim:

1. A plastic closure cap for a container having radially protruding retaining elements for the affixing of said closure cap, the closure cap comprising a closure base and a cylindrical wall abutting said closure base, and a pull-off ring, the wall having a edge area that is oriented away from the closure base, said wall being engageable with the container opening and having a substantially annular attachment area with at least one radially inwardly aligned retaining bead having a retaining area, the retaining area of said bead determining a free inside diameter of the closure cap,

6

said cap further comprising at least two substantially vertical frangible lines being provided in the wall:

the pull-off ring extending at least partially and substantially concentrically around the wall and being connected with the wall at least one connecting point,

the pull-off ring acting upon the edge area of the wall and the vertical frangible lines lying adjacent to the at least one connecting points, such that the vertical frangible lines extend from the edge area of the wall approximately vertically towards the cap base and terminate in an area between the retaining area and the closure base, the retaining bead having more than two interruptions, two of which are arranged such that they cross the frangible lines.

2. closure cap according to claim 1, characterized in that there are two connecting points.

3. A closure cap according to claim 1, characterized in that the pull-off ring is connected with the edge area of the wall by at least one frangible bridge.

4. A closure cap according to claim 1, characterized in that the pull-off ring is a continuous ring.

5. A closure cap according to claim 2, characterized in that the pull-off ring extends from one connecting point to the other connecting point in a sector of at least 270°.

6. A closure cap according to claim 1, characterized in that the vertical frangible lines are provided on an inner surface of the wall.

7. A closure cap according to claim 1, characterized in that the vertical frangible lines are provided on an outer surface of the wall.

8. A closure cap according to claim 1, characterized in that the vertical frangible lines are formed by weakening material of the wall.

9. A closure cap according to claim 1, characterized in that a horizontal hinge is provided in the wall, said hinge extending between ends of two frangible lines, said ends being oriented towards the closure base.

10. A closure cap according to claim 1, characterized in that at least one sealing lip running concentrically to the wall is provided on the closure base and/or the wall.

\* \* \* \* \*



US005762217A

**United States Patent** [19]

Ohmi et al.

[11] Patent Number: **5,762,217**[45] Date of Patent: **Jun. 9, 1998**[54] **RESIN CAP**4,279,353 7/1981 Honma ..... 215/254  
4,534,481 8/1985 Summers et al. .... 215/253[75] Inventors: **Hidehiko Ohmi; Tateo Kubo; Mitsuo Kumata**, all of Hiratsuka, Japan**FOREIGN PATENT DOCUMENTS**[73] Assignee: **Japan Crown Cork Co., Ltd.**, JapanA-1197164 5/1958 France .  
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U-8801621 5/1988 Germany .  
A-430479 2/1967 Switzerland .  
A-2085854 9/1981 United Kingdom .  
A-2086361 9/1981 United Kingdom .[21] Appl. No.: **607,059**[22] Filed: **Feb. 26, 1996**[30] **Foreign Application Priority Data**Mar. 3, 1995 [JP] Japan ..... 7-044431  
Feb. 19, 1996 [JP] Japan ..... 8-030929*Primary Examiner*—Stephen Cronin[51] Int. Cl.<sup>6</sup> ..... **B65D 41/48**[52] U.S. Cl. .... **215/253; 215/274; 215/305; 215/320**[58] Field of Search ..... **215/253, 254, 215/256, 274, 305, 320; 220/269, 276, 782, 784, 786, 318, 319**[56] **References Cited****U.S. PATENT DOCUMENTS**3,462,035 8/1969 Grussen ..... 215/253  
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3,858,742 1/1975 Grussen ..... 215/253  
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3,990,598 11/1976 Zapp et al. .... 215/272  
4,216,872 8/1980 Bean ..... 215/253  
4,230,229 10/1980 Crisci ..... 215/253[57] **ABSTRACT**

The resin cap of this invention comprises a cap proper provided with a skirt portion and a continuous ring member provided so as to cover the outer surface of the skirt portion of the cap proper. A plurality of axially extending cuts are circumferentially spaced in the skirt portion of the cap proper, and the skirt portion of the cap proper and the ring-like member are separated via a cutting surface, but are integrally formed via a plurality of frangible bridge portions or connecting portions upwardly or downwardly of the cutting surface. The outer surface of the skirt portion of the cap proper and the inner surface of the ring-like member are intimately adhered at a portion of the cutting surface. This cap can form a sealing structure having sealing reliability, and can be opened without using any particular tool. Furthermore, it has excellent tamper-evident characteristics.

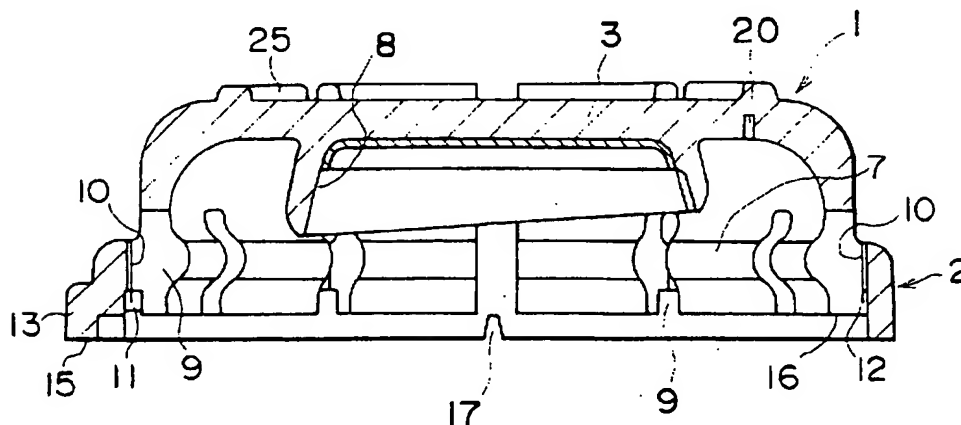
**15 Claims, 10 Drawing Sheets**



FIG. 1

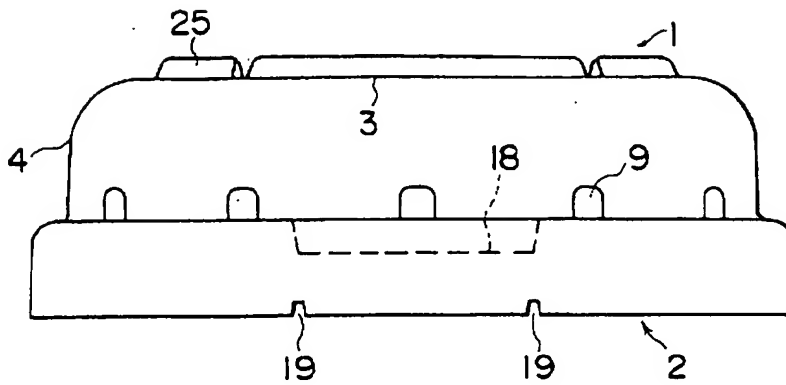


FIG. 2

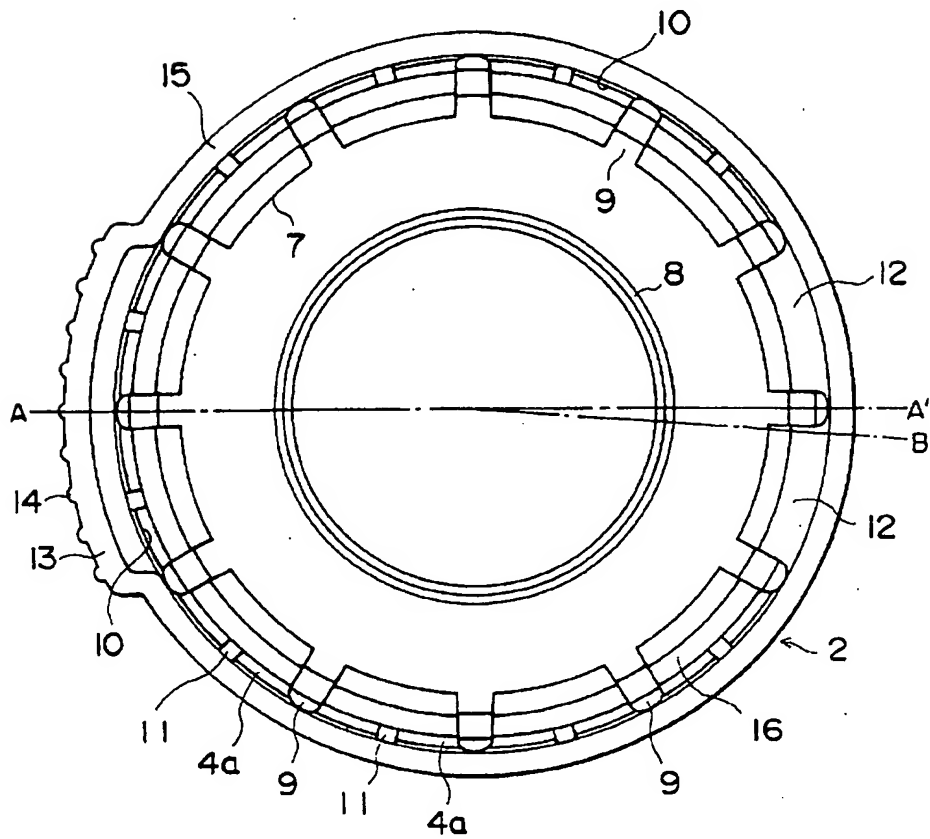


FIG. 3

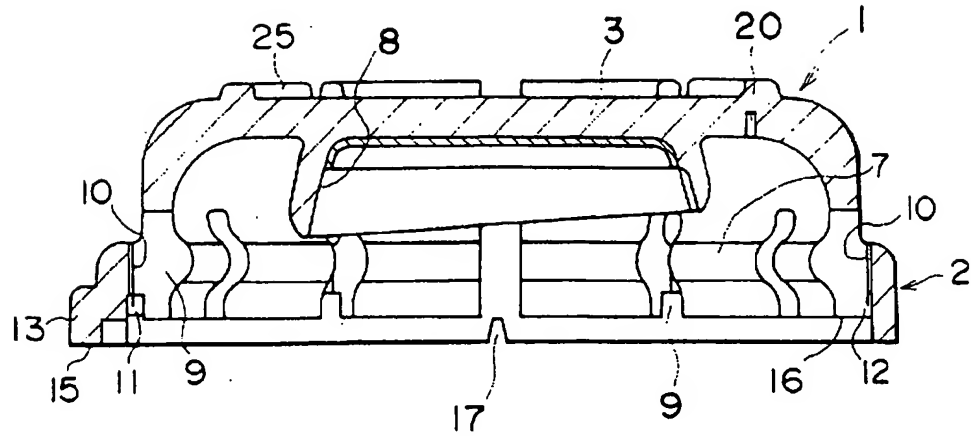


FIG. 4

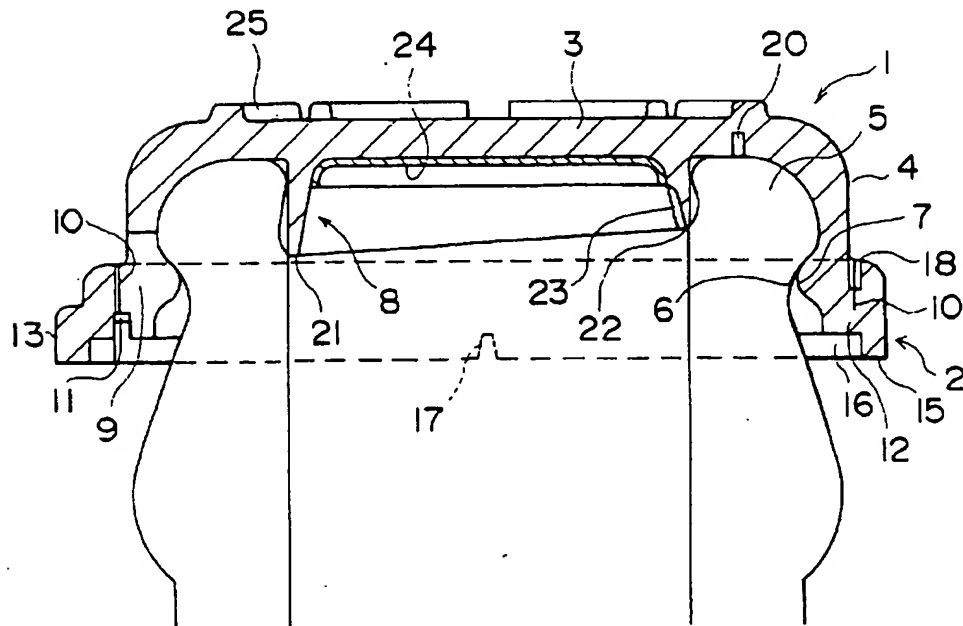


FIG. 5

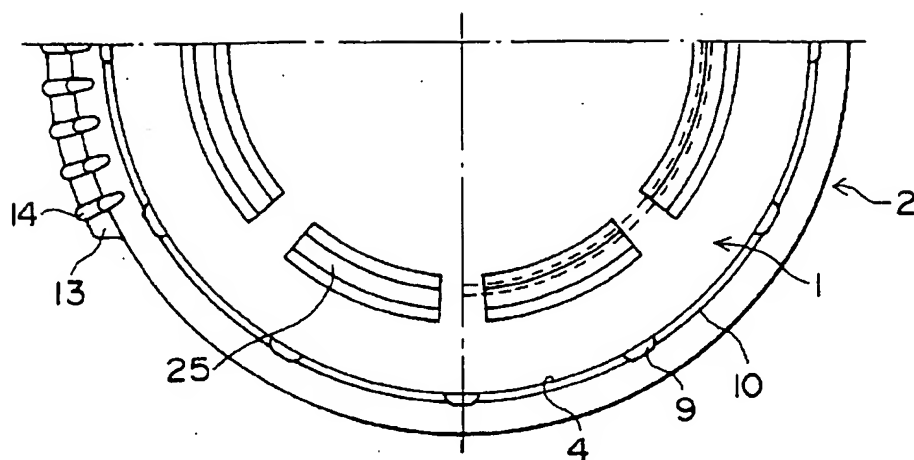


FIG. 6

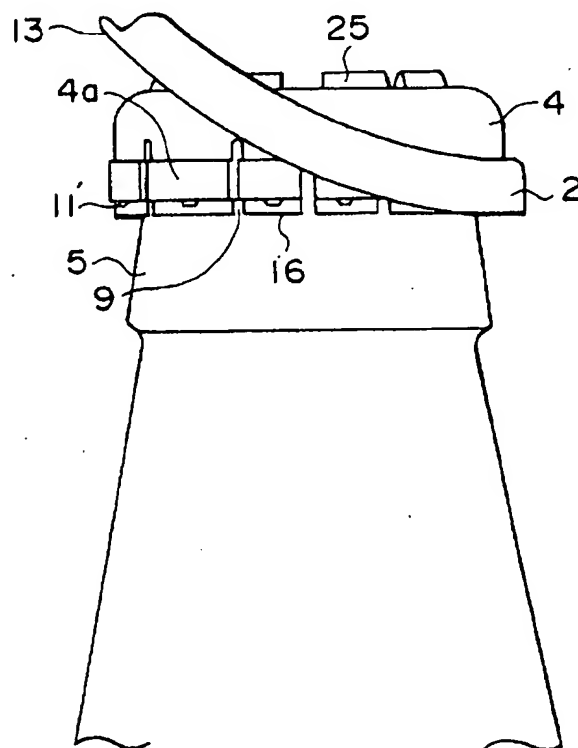


FIG. 7

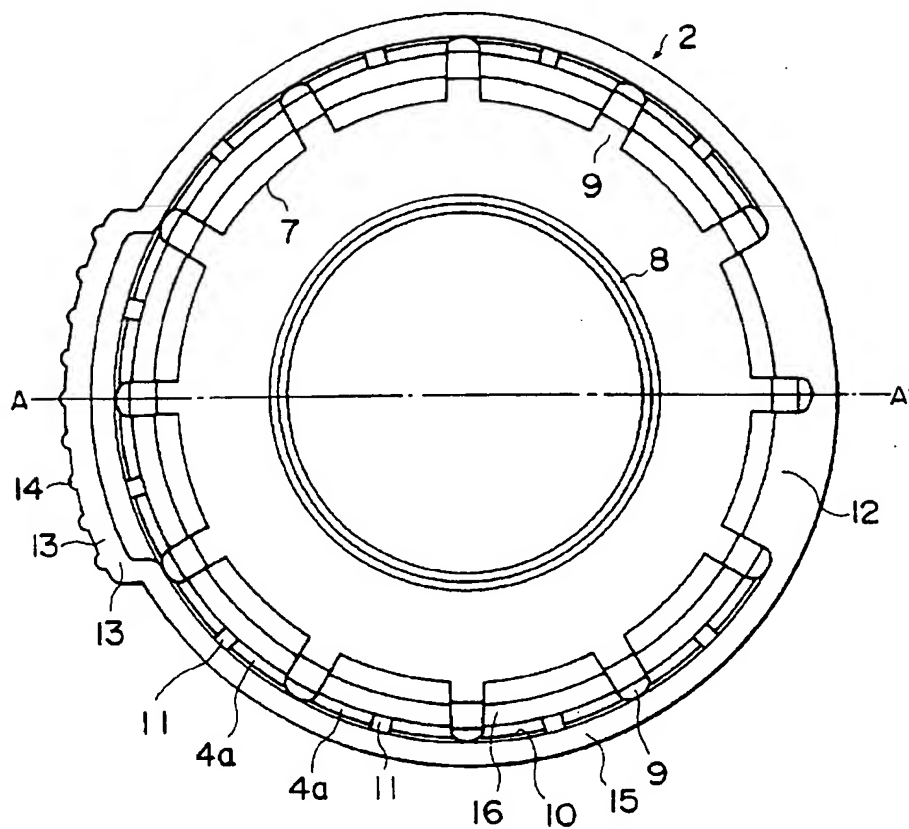


FIG. 8

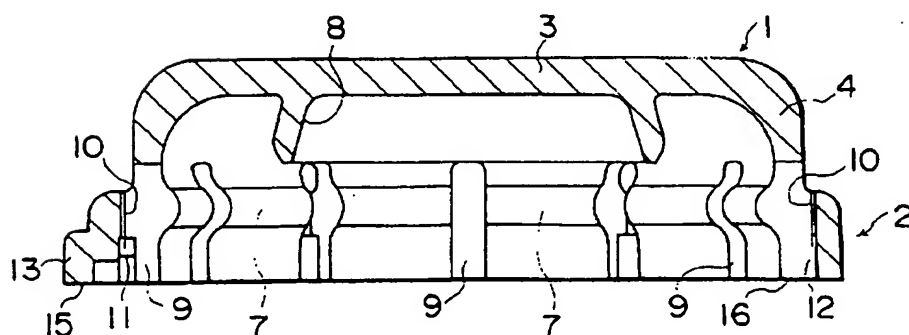


FIG. 9

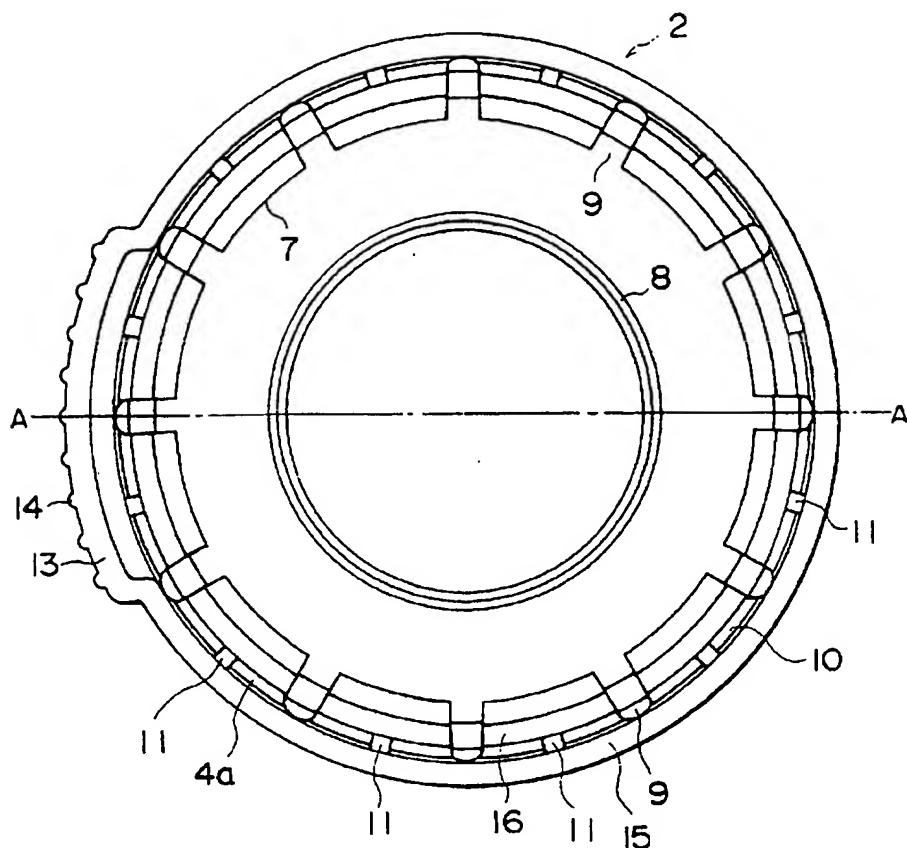


FIG. 10

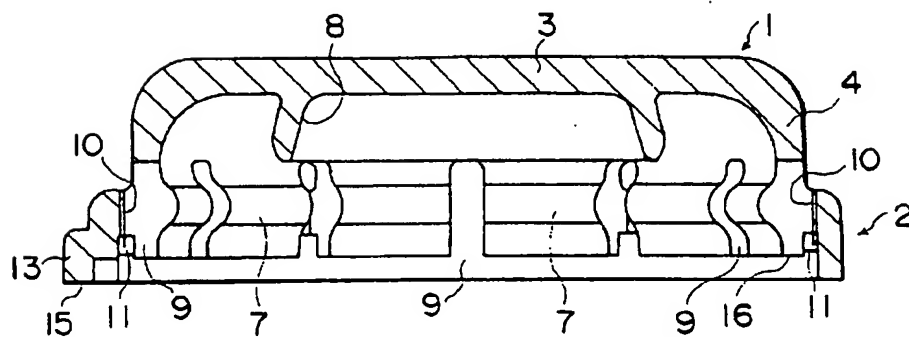




FIG. 13

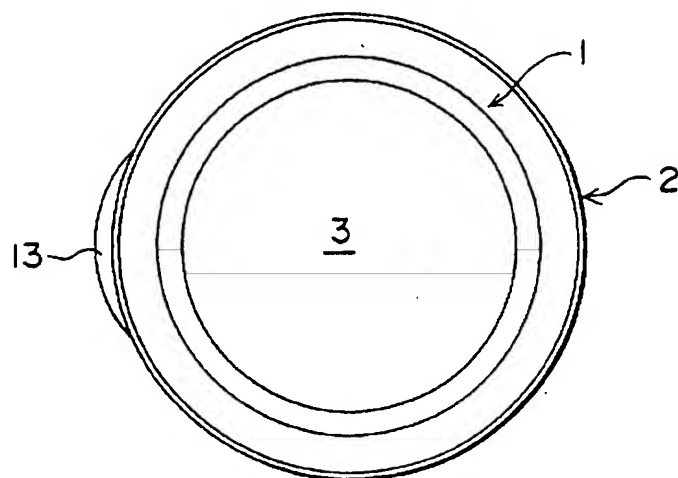


FIG. 14

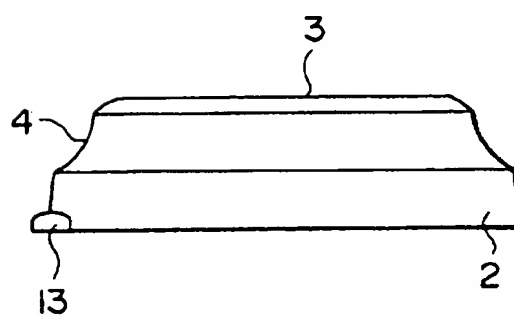


FIG. 15

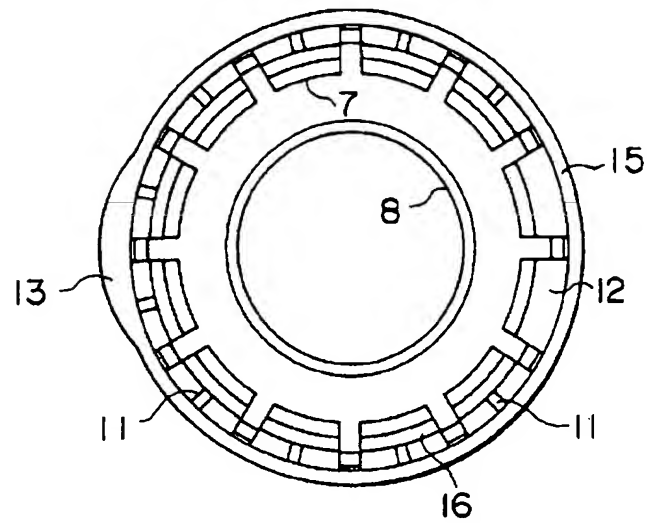


FIG. 16

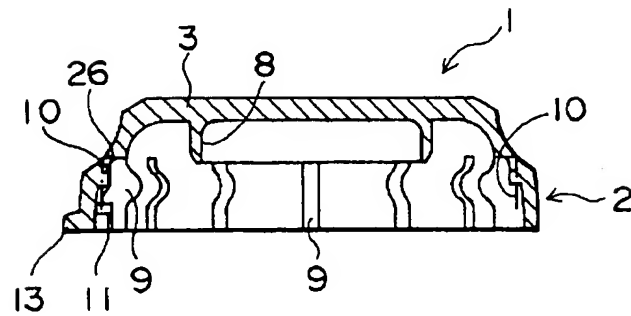


FIG. 17

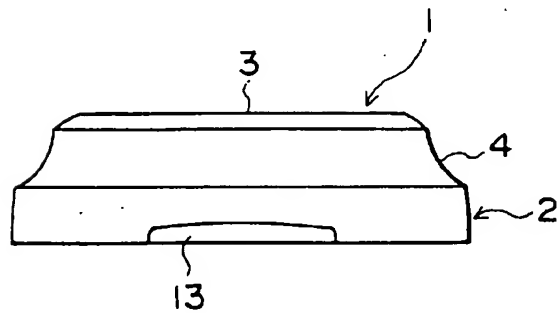




FIG. 18

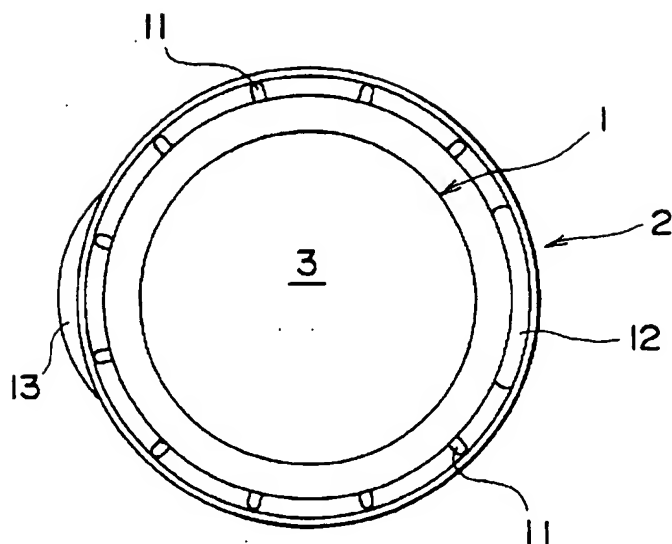


FIG. 19

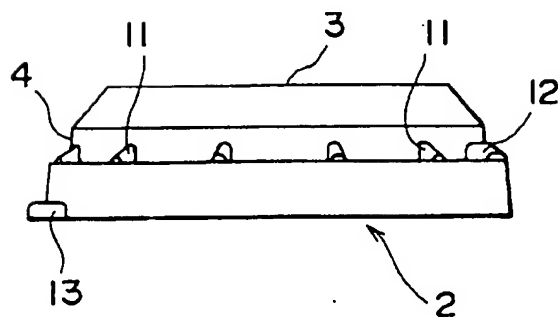


FIG. 20

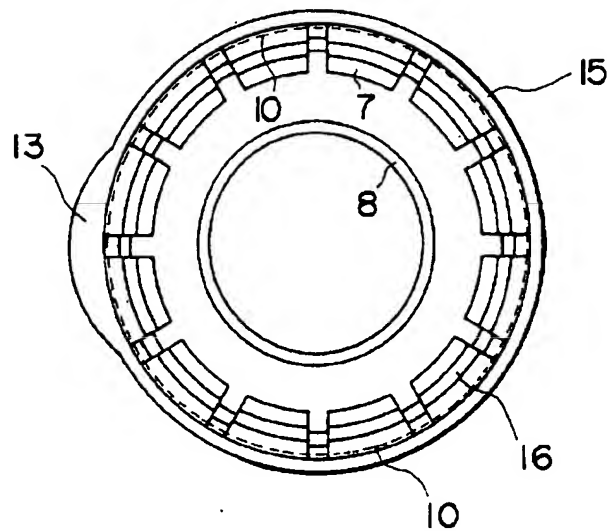


FIG. 21

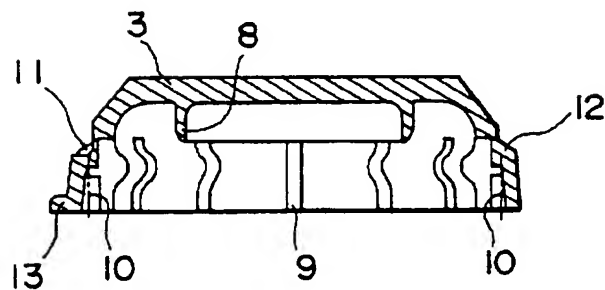
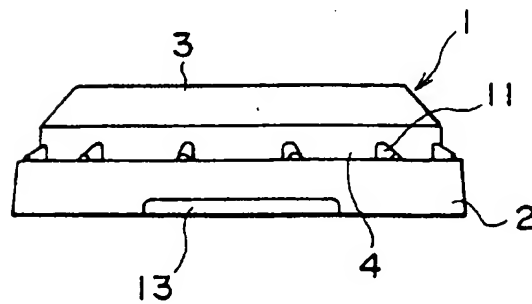


FIG. 22



## RESIN CAP

## BACKGROUND OF THE INVENTION

## 1. [Field of the Invention]

The present invention relates to a resin cap having excellent sealing reliability and can openability, and more specifically, to a resin cap which can form reliable sealing and can be easily and exactly opened and has tamper-evident (TE) characteristics.

## 2. [Description of the Prior Art]

Since a resin cap can be integrally molded, and has excellent moldability and flexibility, it can be fixed to a mouth portion of a container by a stopping operation and has been used heretofore in various forms.

Various resin caps which have excellent sealability, can be easily removed from the mouth portion of the container without using tools, and have excellent openability have been proposed. For example, Japanese Patent Publication No. 10555/1976 describes an unfair act-preventing closure composed of a synthetic resin having a handle on the outer surface of a skirt wall. The handle of this closure is spaced from an outer circumferential surface of the skirt wall and surrounding it. It is not a complete ring but arcuate and its both end portions are firmly fixed to the outer surface of the skirt wall. The inner surface of the handle is connected to the outer surface of the skirt wall by a plurality of easily breakable connecting pieces formed circumferentially at suitable distances. Accordingly, when the handle of the closure mounted on the container is pulled up by hand, the above connecting pieces are broken off and this handle is connected to the skirt wall only at both end portions. By further pulling the handle upwardly, the skirt wall is turned up from a portion where the handle is not formed (between both end portions of the handle), and the closure is removed from the container.

The prior art is significant because it provides a plastic cap which can be opened by hand without requiring any particular tool such as a cap opener and to which an unfair act-preventing function is imparted. However, there is a problem in respect of a sealing reliability. Circumferential protrusions are formed on the inner surface of the skirt wall, and when these protrusions are sealed with the neck portion of the container, the container is sealed. In the above closure, it is impossible to provide the protrusions over the entire circumference of the inner surface of the skirt wall. In order to open the cap by hand, it is impossible to form the protrusion in a portion where the handle is not formed. When the protrusions are formed in this portion, the skirt wall cannot easily be turned up, and the openability of the can becomes unsatisfactory. Since the protrusions for securing sealability are not formed over the entire circumference of the inner surface of the skirt wall, the closure of the above prior art has unsatisfactory sealing reliability.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a resin cap which forms a sealing structure having sealing reliability by a stopping operation, and can be easily opened without using any particular tool and has tamper-evident characteristics.

Another object of the invention is to provide a resin cap in which in a stopping action, a ring-like member protects a skirt portion of a cap proper, in a closure-closed condition, the ring member adheres intimately to the outer surface of the skirt portion of the cap proper to maintain sealability, the

ring-like member is removed at the time of opening the cap, the skirt portion can be easily removed from the mouth portion of the container, and in addition, the ring-like member has tamper-evident characteristics.

According to the present invention, there is provided a cap made from resin which comprises a cap proper comprising a top panel and a skirt having a protrusion engaging with a mouth of a vessel at an interface thereof, and a ring member formed integrally with the cap proper so as to cover an outer surface of the skirt, wherein a plurality of slits elongating in an axial direction are provided in the skirt at an interval into a circumferential direction, the skirt and the ring member are separated by cutting faces but interconnected with a plurality of frangible bridges, if necessary, and with a hinge, and an outer surface of the skirt and an inner surface of the ring member are closely contacted with each other at the cutting portion.

In the present invention, an opening tab is preferably formed in a part of the ring-like member.

The skirt portion of the cap proper and the ring member are preferably formed by injection- or compression molding them integrally, thereafter making a cut by a cutter between the two to separate a portion excluding a bridge portion or further a connecting portion.

The cap of the present invention is composed of a skirt portion in the cap proper and a ring member provided so as to cover the outer surface of the skirt portion, the skirt portion of the cap proper is provided with a plurality of slits extending in an axial direction at intervals in a circumferential direction, the skirt portion of the cap proper is separated from the ring member via a cutting face, the skirt portion and the ring member are integrally formed via a plurality of frangible bridges or further connecting portions on the upper side or under side of the cutting faces, and the outside surface of the skirt portion of the cap proper and the inner surface of the ring member are intimately adhered at a portion of the cutting faces.

The skirt portion of the cap proper is provided with a plurality of slits extending in an axial direction at intervals in a circumferential direction whereby the skirt portion is broadened diametrically outwardly at the time of cap opening so that the cap proper can be easily removed from the mouth portion of the container.

In the present invention, the skirt portion of the cap proper is separated from the ring member via a cutting face, but they are integrally molded through a plurality of frangible bridges or further connecting portions on the upper side or the lower side from the cutting face and the outer surface of the skirt portion of the cap proper and the inner surface of the ring member are adhered intimately at a portion of the cutting face.

First, by intimately adhering the skirt portion to the ring member at the portion of the cutting face, the skirt portion of the cap proper at least in the closed state is circumferentially bundled and fixed by the ring member so that the skirt portion is prevented from broadening outwardly and accurate sealability against the mouth portion of the container is maintained. This feature is especially important in the case of the cap of the present invention which is provided with axially extending slits in the skirt portion. The slits at the skirt portion act so as to weaken the engaging state between the mouth portion of the container and the protrusions of the skirt portion, but as a result of the action of circumferentially bundling and fixing by the ring member, the engaging state becomes firm and accurate.

Since a plurality of frangible bridges or connecting portions for linking the skirt portion of the cap proper to the ring

3

member on an upper side or a lower side than the cutting face, the provision of the cutting surface is prevented from adversely affecting the bridge portions or connecting portions. At the time of closing the cap, since the outer surface of the skirt portion of the cap proper and the inner surface of the ring member are intimately adhered to each other, the action of an outer force on the bridge portions which are frangible is prevented so that the protection of bridge portions at the time of closing the cap is advantageously achieved.

Since in the present invention an opening tab is formed in a part of the ring member, divergence occurs between the ring member and the skirt portion at the cutting face by pushing up or down the tab whereby the bridge portion connecting the cap proper with the ring member is cut off by a shearing force. Because slits are formed in the skirt portion of the cap proper, when the ring member is removed from the skirt portion, the skirt portion is freely broadened diametrically outwardly. Thus, the cap proper is easily eliminated from the mouth portion of the container and can be opened easily without using a tool.

By forming a plurality of ribs in an outer surface of the opening tab, the strength of the opening tab is reinforced, or its position can be clearly shown.

When the opening of the cap has already been performed, the bridge portion is broken, and the ring member can be moved up and down. It is thus known that the cap is already opened. This further imparts tamper-evident characteristics.

Since in the present invention the skirt portion of the cap proper and the ring member are formed by integral injection or compression molding, forming slits by a cutter between both to separate a portion excepting the bridge portions or further connecting portions, they can be produced by using a mold composed usually of a core and a cavity, and a molding procedure is easy.

Between the skirt portion of the cap proper and the ring member, only the frangible bridge portions may be formed, whereby the cap proper may be separated from the ring member in opening the cap. In this case, as a result of cutting off the ring member, tamper-evident characteristics become more marked. Furthermore, when the ring member is cut off, the lower end of the skirt portion is pushed up by a finger whereby by the existence of slits, the cap proper can be easily opened.

On the other side of the tab, connecting portions for connecting both may be positioned between the skirt portion of the cap proper and the ring member, and in opening the cap, the bridge portions are broken by pushing up or down the tab. Thereafter, by lifting the ring member, the engagement between the skirt portion of the cap proper and the mouth portion of the container can be released. In this case, the advantage is that the ring member can be utilized as an opening handle of the cap proper.

An inner ring which is engaged with the inner circumferential side of the mouth portion of the container may be formed in the top panel portion. In this case, sealing may be performed at the inner circumferential side of the mouth portion of the container, and the sealing advantageously becomes more accurate.

In the cap of this invention, the lower end of the ring member may be positioned below the lower end of the skirt portion of the cap proper. By so doing, the lower end of the skirt portion of the cap proper is hidden by the ring member. When a cap is opened by inserting an instrument into the lower end of the skirt portion, the bridge portions necessary break. Therefore, tamper-evident characteristics can be increased.

4

Furthermore, the lower end of the ring member and the lower end of the skirt portion of the cap proper may be provided so that they are positioned on the same horizontal plane. In this case, when empty caps are loaded, a load, etc. is added to the bridge portions to prevent breakage.

Furthermore, a weakened portion, such as a cut, can be formed to display cap opening at a lower part of the ring member in a direction of about 90° C. with respect to the tab of the ring member. By this cut formation, when an opening tab is pushed upwardly to open the cap, since the ring member is bended and broken from the weakened portion, the display of cap opening becomes more clear. When opening by means of an instrument is forcibly carried out from the opposite side of the opening tab, that is to say, from the connecting portion, the weakening portion is bended and broken, it can be learned that the opening is unfairly carried out.

Furthermore, in the upper portion or the lower portion of the connecting portions, partial weakened portions may be formed. When a tool is inserted into the connecting portions to perform unfair opening, the ring member is opened outwardly, and the engagement of the tool is released. Thus, tamper-evident characteristics increase.

In order to increase tamper-evident characteristics, the top panel portion of the connecting portion side may be provided with partial weakened portions. When an unfair opening of the cap by the tool is carried out from the connecting portion side, the top panel portion of the cap is cracked, and one can learn the performance of an unfair opening.

In the cap of this invention, the inner ring can have an inclined end edge so that the inner ring is relatively long on the tab side, and relatively short on the connecting portion side. As already stated, the opening of the cap proper can be performed by lifting the ring member from the side of the connecting portions. At the time of opening from the side of the connecting portions, a gas vent from the short inner ring is effectively carried out to effectively prevent blowing of contents, namely blow off.

The above prevention of blow off is also effectively carried out by providing weakened portions on the inner surface of the inner ring on the side of the connecting portions. This makes the deformation of the inner ring on the side of the connecting portions easy, and the release of the gas inside the container is carried out effectively via the inner ring.

Furthermore, a gas-barrier material can be insert-molded in the top panel portion of the inner surface of the inner ring. This makes it possible to prevent the permeation of gas through a plastic cap wall, and the preservability of contents can be increased.

Furthermore, in the cap of the present invention, a total circumferential ring or intermittent rings which project upwardly into an outer circumferential portion of the top panel portion may be formed, whereby it can be prevented from causing the trouble when the containers with the cap are loaded with each other. When the contained solution is a carbonated beverage, doming occurs on the top panel of the cap. Accordingly, when such containers are loaded, the top panel portion which has been domed is pressed, and the engagement protrusion of the skirt portion is broadened and the sealing reliability is decreased, and as a result of forming the above ring, such an inconvenience can be prevented.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view showing one example of the cap of the present invention;

5

FIG. 2 is a bottom view of the cap of FIG. 1;

FIG. 3 is a sectional view taken along line A-A' of FIG. 2;

FIG. 4 is a sectional view taken on line A-B of FIG. 2 in a condition in which the cap is mounted on the mouth portion of the container;

FIG. 5 is an upper view of the cap of FIG. 4;

FIG. 6 is an explanatory view showing the opened state of the cap of FIG. 4;

FIG. 7 is a bottom view of the cap of still another example when the under surface is the same horizontal plane;

FIG. 8 is a sectional view taken along line A-A' in FIG. 7;

FIG. 9 is a bottom view of the cap of another Example not provided with a connecting portion;

FIG. 10 is a sectional view taken along line A-A' in FIG. 9;

FIG. 11 is a bottom view of the cap of another Example not provided with a connecting portion using the lower surface as the same horizontal plane;

FIG. 12 is a sectional view taken along line A-A' in FIG. 11;

FIG. 13 is an upper surface view showing an example in which cuts are provided so as not to expose into the outer circumference of the skirt portion;

FIG. 14 is a front view of the cap of FIG. 13;

FIG. 15 is a bottom view of the cap of FIG. 13;

FIG. 16 is a sectional view of the cap of FIG. 13;

FIG. 17 is a left side view of the cap of FIG. 13;

FIG. 18 is an upper surface view showing an example in which bridge portions and connecting portions are provided on the upper side of the cutting face;

FIG. 19 is a front view of the cap of FIG. 18;

FIG. 20 is an upper surface view of the cap of FIG. 18;

FIG. 21 is a sectional view of the cap of FIG. 18; and

FIG. 22 is a left side view of the cap of FIG. 18.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will now be described in detail with reference to the accompanying drawings.

In the side view (FIG. 1) showing one example of the cap of this invention, the bottom view (FIG. 2), the A-A' sectional view of FIG. 2 (FIG. 3), the sectional view (FIG. 4) shown by A-B section in a condition in which the cap is mounted on the mouth portion of the container, and the upper surface view (FIG. 5), the cap of this invention, roughly speaking, consists of a cap proper 1 and ring member 2. The cap proper 1 is composed of a top panel portion 3 and a skirt portion 4 suspending from the outer circumference of the panel 3.

As is best shown in FIG. 4, protrusions 7 which are engaged with concave portions 6 on the outer circumferential side of the mouth portion 5 of the container are formed in the inner circumference of the skirt portion 4 so that the mouth portion 5 of the container is intimately adhered to the inside surface of the top panel portion 3 to perform sealing. Furthermore, in this specific example, the top panel portion 3 has formed therein an inner ring 8 to be engaged with the inner circumferential side of the mouth portion 5 of the container whereby sealing is carried out in the inner circumferential side of the mouth portion 5 of the container to make the sealing more accurate.

6

The ring member 2 is not divided and it is provided so as to cover at least a part of the outer surface of the skirt portion 4 in the form of a continuous ring. The skirt portion 4 of the cap proper 1 covered with the ring members 2 is provided with a plurality of slits or cuts 9 extending in an axial direction at intervals in a circumferential direction. The skirt portion 4 of the cap proper 1 and the ring member 2 are separated via the cutting face 10, and the skirt portion 4 and the ring member 2 are integrally formed via a plurality of frangible bridge portions 11 and unbreakable connecting portions (hinge) 12 which are below the cutting face 10. The outer surface of the skirt portion 4 of the cap proper and the inner surface of the ring member 2 are intimately adhered to each other at a portion of the cutting face 10 in a condition in which the cap proper 1 is applied to the mouth portion 5 of the container (FIG. 4).

An opening tab 13 protruding diametrically outwardly is formed at a part of the ring member 2, and in opening the cap, the tab is held so that the ring member 2 may be pushed up or down. As shown in FIG. 5, a rib 14 extending diametrically is formed in the opening tab 13 to reinforce the opening tab 13 or display its position.

The plurality of axially extending cuts 9 provided in the skirt portion 4 of the cap proper 1, in a cap opening condition (in which the ring member 2 is removed), make it possible for the skirt portion 4 to broaden diametrically outwardly, whereby the engagement between the concave portion 6 of the outer circumference of the mouth portion of the container and the inwardly directed protrusion 7 of the skirt portion is released and the elimination of the cap proper 1 from the mouth portion 5 of the container can be easily carried out. The number of cuts 9 provided or the transverse gaps of these cuts may be properly determined.

In the cap of the present invention, the number of cuts 9 provided in the skirt portion 4 may differ depending upon the diameter of the cap, but it is preferably 2 to 20, especially 8 to 12.

By adhering the skirt portion 4 and the ring member 2 intimately at a portion of the cutting face 10, the skirt portion 4 of the cap proper is circumferentially bundled and fixed at least in a cap closed condition with the ring member 2 whereby the skirt portion 4 is prevented from broadening outwardly, and accurate sealing with respect to the mouth portion of the container can be maintained. In the cap of this invention in which the cuts 9 extending in an axial direction are provided in the skirt portion 4, this intimate adhering condition is particularly important. The cuts 9 in the skirt portion 4 act to weaken the condition of engagement between the concave portion 6 of the outer circumference of the mouth portion of the container and the protrusion 7 of the skirt portion 4. But when the force of bundling and fixing acts by the ring member 2, the engagement condition becomes firm and accurate.

Since the plurality of frangible bridges 11 or the linking portions 12 are provided for linking the skirt portion 4 of the cap proper and the ring member 2 below the cutting face 10, the engraving of the cutting face 10 is prevented from adversely affecting the bridge portions 11 or the connecting portions 12. Because at the time of closing the cap the outer surface of the skirt portion 4 of the cap proper is adhered intimately to the inner surface of the ring member 2 at a portion of the cutting face 10, an outer force is prevented from acting on the breakable bridge portions 11, and the protection of the bridge portions 11 is perfect at the time of closing the cap.

In the present invention, the intimate adhering condition of the skirt portion 4 of the cap proper and the ring member

2 via the cutting face and the formation of the bridge portions 11 and the connecting portions 12 may be carried out by integrally injection molding or compression molding both, thereafter forming a cut between both by means of a cutter to separate a portion excluding the bridge portions 11 and the connecting portions 12. Therefore the cap of the present invention can be produced with good efficiency and within a short period of time by usually using a mold composed of a core and a cavity, an advantage may be obtained in that the accuracy of each part of the cap is high, and the occurrence of poor goods is small.

The number of the bridge portions 11 provided between the skirt portion 4 of the cap proper and the ring member 2 is such that the skirt piece 4a between adjoining cuts 9, 9 and the ring member 2 is connected via at least one bridge portion 11. The position of providing the bridge portion 11 may be variously provided. For example, as shown in FIG. 2, one bridge portion may be provided in a skirt piece 4a, or two bridge portions may be provided on both ends of the skirt piece 4a. The position and the number are not particularly limited so long as at the time of closing the cap, the breakage of the bridge portions is prevented and at the time of opening the cap, the bridge portions can be easily broken. The cross-sectional area of the bridge portion 11 in its direction of the cutting face 10 of the bridge portion 11 is preferably 0.1 to 0.8 mm<sup>2</sup>, especially 0.2 to 0.4 mm<sup>2</sup>, per one bridge portion.

An opening tab 13 protruding diametrically outwardly is formed at a part of the ring member 2. This opening tab 13 is positioned in an opposite direction (180° direction) with respect to the connecting portion 12. By pushing up or down the opening tab 13, a divergence occurs between the ring member and the skirt portion at the cutting face, and the bridge portion 11 linking the cap proper 1 and the ring member 2 is cut off under a shearing force.

FIG. 6 shows the state of lifting the ring member 2. Since the cutting face 9 is provided in the skirt portion 4 of the cap proper, when the ring member 2 is removed from the skirt portion 4, the broadening of the skirt piece 4a in a diametrically outward direction becomes free and the cap proper 1 can be easily eliminated from the mouth portion 5 of the container. Hence, the container can be easily opened without using any particular tool. Since in FIG. 6 the ring member 2 is fixed to the cap proper 1 at the connecting portion 12, and is lifted upwardly as a gripping tool, the bridging portion 12 becomes a fulcrum and the cap proper 1 can be easily removed.

When the cap has already been opened, the bridging portions 11 have already been broken and the ring members 2 can be freely moved up or down. From this state, one can already learn that the cap has already been opened. By breakage and bending at the weakening portion 17, it is learned that the cap is already opened, and therefore tamper-evident characteristics are given.

Various mechanisms preventing from opening unfairly cap and mechanisms for showing that unfair cap opening is carried out can be provided in the cap of this invention. Some of these mechanisms are shown in FIG. 4.

In the cap shown in the specific example of FIG. 4, the lower end 15 of the ring member 2 is positioned below the lower end 16 of the skirt portion 4 of the cap proper. By so doing, the lower end 16 of the skirt portion of the cap proper is hidden by the ring member 2, and therefore, when an attempt is made to open the cap by inserting an instrument into the lower end 16 of the skirt portion, the bridge portions 11 are broken, and the fact of opening the cap can be known

and tamper-evident characteristics can be increased. The lower end 15 of the ring member 2 suitably extends downwardly over about 0.8 to 1.2 mm below the lower end 16 of the skirt portion.

It is possible to form a weakened portion for displaying cap opening, such as a cut 17, in a lower portion of the ring member in a direction of about 90° with respect to the opening tab 13 of the ring member 2. When an opening tab is pushed upwardly to open the cap, the breakage and bending occur at the weakening portion 17 (this deformation is a plastic deformation). Even if this is returned to the original, the fact of cap opening can be known, and tamper-evident characteristics can be increased more. Thus, when cap opening by a tool from the opposite side of the opening tab, namely, the side of the connecting portion 12, is forcibly carried out, the weakened portion 17 breaks, and one learns that the cap opening is performed unfairly.

Furthermore, a partly weakened portion, namely a groove 18, may be formed on the upper portion of the connecting portion 12, or a weakened portion, namely a cut 19, may be formed in both ends of a lower portion of the connecting portion 12. When an attempt is made to open the cap unfairly by inserting a tool in the connecting portion, the ring member is opened outwardly, the engagement of the tool is liable to be released, and the tamper-evident characteristics can be increased.

In order to increase the tamper-evident characteristics, a partial weakened portion 20 may be formed in the top panel portion 3 on the side of the connecting portion 12. Therefore, when an unfair opening of the cap is carried out by using a tool from the side of the connecting portion 12, the top panel portion 3 of the cap is deformed or broken, and one can learn that the cap has been unfairly opened.

In the cap of the specific example shown in FIG. 4, an inner ring 8 is formed to have an inclined end edge so that the inner ring 8 is relatively long on the side of an opening tab 21, and is relatively short on the side of a connecting portion 22. As already stated before, the opening of the cap proper is carried out from the side of the connecting portion 12 by lifting the ring member 2. In the cap opening from the side of the connecting portion 12, the venting of a gas from the shorter inner ring 22 is carried out effectively, and the blowing of the contents, that is to say the blowing off, can be prevented effectively.

The above-mentioned prevention of blow off can be effectively carried out by providing a weakened portion 23 on the inner surface of the inner ring 22 on the side of the connecting portion. This makes it easy to transform the inner ring 22 on the side of the connecting portion, and the gas inside the container is effectively released via the inner ring 22.

Furthermore, a gas-barrier material 24 may be provided by insert molding in the top panel portion of the inside surface of the inner ring 8. This makes it possible to prevent permeation of the gas through the plastic cap wall and to increase the preservability of the contents. Examples of the gas-barrier material include, for example, metal foils such as aluminum foil, and a gas-barrier resin such as an ethylene/vinyl alcohol copolymer, a vinyl chloride resin, a vinylidene chloride resin, nylon resin, and gas-barrier polyesters.

In place of the gas-barrier material or in combination with the gas-barrier material, an oxygen absorbing layer may be provided in the top panel portion. As the oxygen absorbing layer, iron-type oxygen absorbing agents, for example, dispersed in a resin may be used.

In the cap of the specific example shown in FIG. 4, a total circumferential or intermittent ring 25 may be formed which

protrudes upwardly into an outer cylindrical portion of the top panel portion 3. By this action, the inconvenience of loading the containers with each other in which the cap is provided can be effectively prevented. When the contained product is a carbonated beverage, the top panel of the cap which is domed is pressed when the containers are loaded and the engaging protrusions 7 of the skirt portion is proddened diametrically outwardly to reduce sealability, but the formation of the ring 25 can prevent such an inconvenience.

In the caps shown in FIGS. 1 to 5, the upper portion of the cut 9 is exposed to an outside portion as best shown in FIG. 1. The caps of these examples are advantageous in that the contents adhering to the outer circumference of the mouth portion at the time of filling the contents can be washed and removed through the cuts 9.

In the cap of the bottom view (FIG. 7) and the cap of the sectional view of line A-A' (FIG. 8) in FIG. 7 in other examples, the lower end 15 of the ring member 2 and the lower end 16 of the skirt portion 4 of the cap proper may be provided so as to be positioned on the same horizontal plane. In this case, it is possible to prevent effectively the addition of a load on the bridge portion 11 at the time of loading caps and the consequent breakage of the bridge portion 11.

In the caps of the bottom view (FIG. 9) and the sectional view along line A-A' (FIG. 10) in FIG. 9 of other examples, only the frangible bridge portion 11 is formed between the skirt portion 4 of the cap proper and the ring member 2, and on the opposite side of the opening tab 13, the connecting portion 12 is not formed. In opening the cap, the cap proper 1 and the ring member 2 are cut off and separated from each other. In this case, the ring member 2 is cut off, and the tamper-evident characteristics become more marked. Furthermore, even when the ring member 2 is cut off, the lower end 16 is pushed upwardly by a finger, the existence of the cut or slit 9 can easily open the cap proper.

When the skirt portion 4 is connected to the ring member 2 by only the breakable bridge portion 11 alone, the opening tab is not limited to one piece, but two tabs may be provided in a symmetrical position. Furthermore, more than two tabs may be provided.

In the caps of examples shown in the bottom view of FIG. 11 and the sectional view of FIG. 12, the lower end 16 of the skirt portion 4 of the cap proper and the lower end 15 of the ring member 2 are provided so that they are positioned on the same horizontal plane. Except that they are the same as in FIGS. 9 and 10.

In the present invention, the cuts 9 may be provided so that they are not exposed into the outer circumference of the skirt portion. In the upper surface view (FIG. 13), the front view (FIG. 14), the bottom view (FIG. 15), the sectional view (FIG. 16) and the left side view (FIG. 17) showing these examples, the constructions of the individual parts have been the same as explained hereinabove. But the outer upper portion 26 of the cut 9 are provided so that it does not reach the outer surface of the skirt portion 4, and therefore, the cut 9 is covered completely with the upper surface of the skirt portion. In the cap of this specific example, an advantage is achieved in that dirt is prevented from entering in the cut 9 and the cap is sanitary.

In the examples explained above, the bridge portion 11 and the connecting portion 12 are provided below the cutting face 10, but in the present invention, the bridge portion and the connecting portion may be provided above the cutting face. In the upper surface view (FIG. 18), the front view (FIG. 19), the bottom view (FIG. 20), the sectional view

(FIG. 21) and the left side view (FIG. 22) showing these examples, the constructions of the individual parts are the same as explained hereinabove, but the bridge portion 11 and the connecting portion 12 are formed above the cutting surface 10. In this case, the bridge portion 11 can be seen from outside at a first sight, and it becomes advantageous that the fact of opening becomes clearer.

Examples of the resin used to form the cap are various plastics, such as low-, medium- and high-density polyethylenes, linear low-density polyethylene, polypropylene, thermoplastic polyesters, polyamides, styrene resins, and ABS resin.

The plastic cap of this invention is prepared by using the above resins, and usually integrating the cap proper and ring member by means of injection molding, compression molding, etc. The cutting face is usually produced by applying a cutting processing after the molding step. Of course, a cutting surface can be formed simultaneously with the molding step.

Separately, a liner may be applied to the cap proper. In this case, it is possible to use low-density polyethylene, ethylene copolymers, various rubber or thermoplastic elastomers, acrylic resin plastisol and vinyl chloride resin plastisol.

According to this invention, the above-mentioned constructions make it possible to form a sealing structure having sealing reliability at the time of closing the cap, and to open the cap easily without using any particular tool at the time of cap opening. In addition, this is advantageous that tamper-evident characteristics are imparted. Furthermore, at the time of closing the cap, the ring member protects the skirt portion of the cap proper, in the state of a closure being closed, the ring member adheres intimately to the outer surface of the skirt of the cap proper to maintain sealability, and at the time of opening the cap, the skirt portion can be easily eliminated from the mouth portion of the container as a result of removing the ring member. In addition, it is advantageous that the ring member has tamper-evident characteristics.

What we claim is:

1. A resin cap comprising:

a cap proper which comprises a top panel and a skirt having a protrusion engaging with a mouth of a container at an interface thereof; and

a ring member formed integrally with the cap proper so as to cover an outer surface of the skirt;

wherein a plurality of slits elongating in an axial direction are provided in the skirt at an interval into a circumferential direction, the skirt and the ring member are separated by a cutting surface but interconnected with only breakable bridges on an upper side of the cutting surface and an outer surface of the skirt and an inner surface of the ring member are contacted intimately with each other at the cutting surface, and in opening the cap, the cap proper is separated from the ring member.

2. A cap of claim 1 wherein an opening tab is formed in a part of the ring member.

3. A resin cap comprising:

a cap proper which comprises a top panel and a skirt having a protrusion engaging with a mouth of a container at an interface thereof; and

a ring member formed integrally with the cap proper so as to cover an outer surface of the skirt;

wherein a plurality of slits elongating in an axial direction are provided in the skirt at an interval into a circum-

## 11

- ferential direction, the skirt and the ring member are separated by a cutting surface but interconnected with only breakable bridges on an under side of the cutting surface and an outer surface of the skirt and an inner surface of the ring member are contacted intimately with each other at the cutting surface, and in opening the cap, the cap proper is separated from the ring member.
4. A cap of claim 3 wherein an opening tab is formed in a part of the ring member.
5. A resin cap comprising:  
 a cap proper which comprises a top panel a skirt having a protrusion engaging with a mouth of a container at an interface thereof;  
 a ring member formed integrally with the cap proper so as to cover an outer surface of the skirt; and  
 an opening tab formed in a part of the ring member;  
 wherein a plurality of slits elongating in axial direction are provided in the skirt at an interval into a circumferential direction, the skirt and the ring member are separated by a cutting surface but interconnected with breakable bridges and an unbreakable connecting portion, an outer surface of the skirt and an inner surface of the ring member are contacted intimately with each other at the cutting surface, and a weakened portion for clearly indicating unfair opening is formed in a lower portion of the ring member in a direction of about 90° with respect to the tab of the ring member.
6. A cap of claim 5 wherein the unbreakable connecting portion is positioned on an opposite side of the tab, in

## 12

- opening the cap, the tab is pushed up or down to break the breakable bridges, and then by lifting the ring member, the cap proper is removed from the mouth of the container together with the ring member.
7. A cap of claim 6 wherein a lower end of the ring member is positioned below a lower end of the skirt of the cap proper.
8. A cap of claim 6 wherein a lower end of the ring member and a lower end of the skirt of the cap proper are positioned on the same horizontal plane.
9. A cap of claim 6 wherein a plurality of ribs are formed in an upper surface of the opening tab.
10. A cap of claim 6 wherein the cutting face is formed by cutting a portion between the skirt and the ring member which are obtained by integral-molding.
11. A cap of claim 6 wherein a circumferential ring projecting upwardly is formed in the outer circumferential portion of the top panel.
12. A cap of claim 11 wherein the circumferential ring extends intermittently in the circumferential direction.
13. A cap of claim 6 wherein an inner ring to be engaged with the inner circumferential side of the mouth of the container is formed in the top panel.
14. A cap of claim 13 wherein the inner ring is relatively long on the tab side, and the inner ring is relatively short on the side of unbreakable connecting portion.
15. A cap of claim 13 wherein a barrier material is insert-molded in an inner surface of the top panel inside of the inner ring.

\* \* \* \* \*





US005303837A

**United States Patent** [19]

Adams et al.

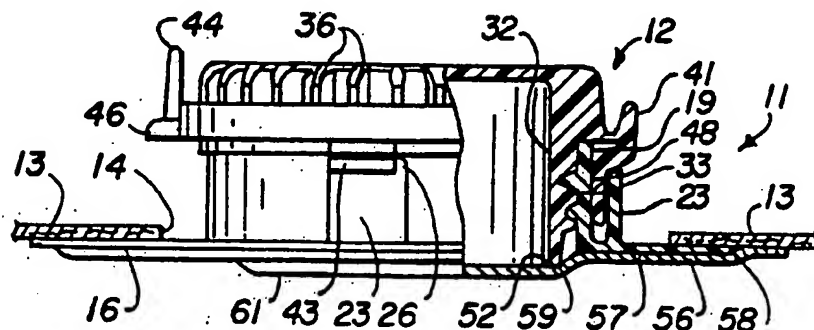
[11] Patent Number: **5,303,837**[45] Date of Patent: \* **Apr. 19, 1994****[54] ONE-PIECE FITMENT AND PLUG WITH TAMPER-EVIDENT BAND****[75] Inventors:** Brian M. Adams, Newark; Daniel Luch, Los Gatos, both of Calif.**[73] Assignee:** Portola Packaging, Inc., San Jose, Calif.**[\*] Notice:** The portion of the term of this patent subsequent to Dec. 21, 2010 has been disclaimed.**[21] Appl. No.:** 823,200**[22] Filed:** Jan. 21, 1992**Related U.S. Application Data****[63]** Continuation-in-part of Ser. No. 664,658, Mar. 5, 1991, abandoned, and a continuation-in-part of Ser. No. 780,774, Oct. 22, 1991, Pat. No. 5,174,465.**[51] Int. Cl.<sup>3</sup>** ..... B65D 47/10; B65D 51/18; B65D 55/02**[52] U.S. Cl.** ..... 220/254; 220/265; 220/270; 220/276; 220/359; 215/214; 215/232; 215/253; 215/256; 215/356; 229/125.15; 222/541; 222/562; 222/566**[58] Field of Search** ..... 220/265, 254, 270, 276, 220/359; 215/214, 216, 232, 252, 253, 254, 256, 356, 32, 33; 229/125.15; 222/541, 545, 562, 566, 569**[56] References Cited****U.S. PATENT DOCUMENTS**

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**Primary Examiner**—Allan N. Shoap**Assistant Examiner**—Vanessa Caretto**Attorney, Agent, or Firm**—Julian Caplan**[57]****ABSTRACT**

A fitment attached around an aperture in a container has a flange from which extends an internally threaded spout closed by an initially integrally molded externally threaded plug. The plug is moved axially into the spout, the threads slipping over each other. The plug has an outward extending slotted ear and the fitment has an upward extending finger aligned with the slot in the ear and formed with tangs which lock the finger and ear together as the plug is moved to the spout, thereby making the device tamper-evident. As a further feature of the invention, an over-size foil seal extends across the bottom of the flange and is welded or otherwise adhered to the bottom of the flange. After assembly the portion of the foil extending outside the flange is welded or otherwise adhered to the carton. This further feature is particularly useful in aseptic packaging. Optionally the lower edge of the plug may be welded to the foil so that when the consumer unscrews the plug the foil under the spout is torn away.

**14 Claims, 5 Drawing Sheets**

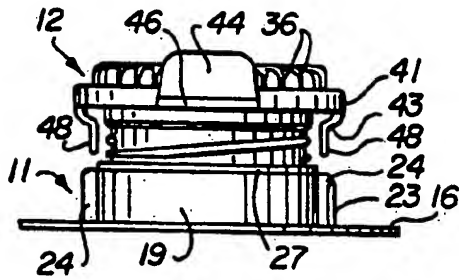


FIG. 1

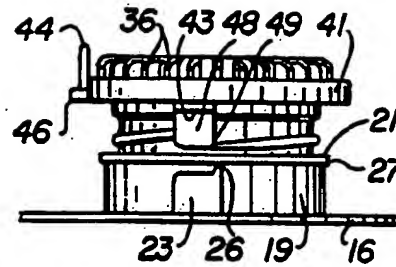


FIG. 2

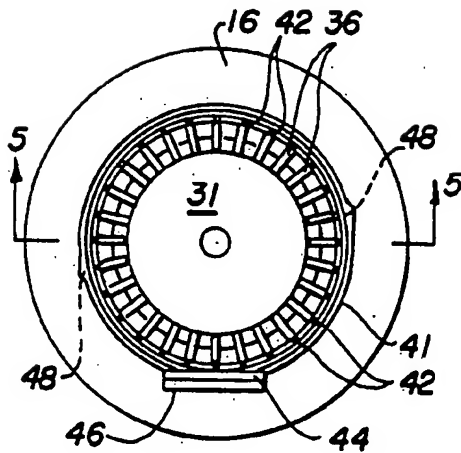


FIG. 3

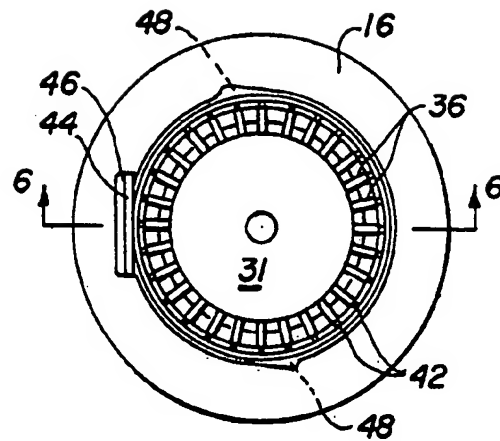


FIG. 4

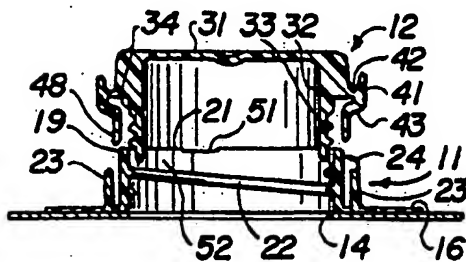


FIG. 5

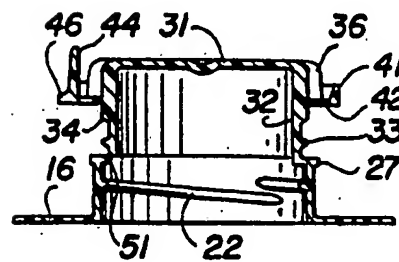


FIG. 6

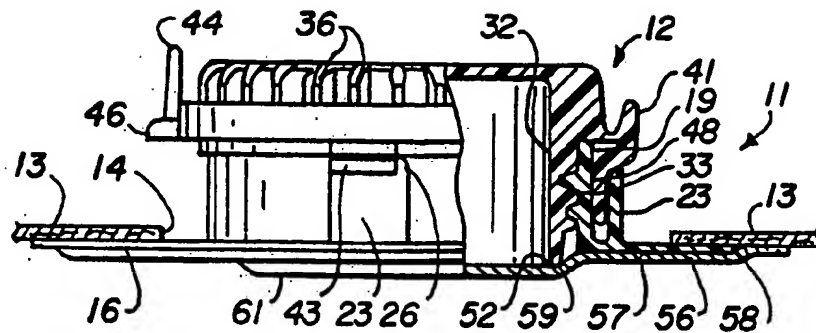


FIG. 7

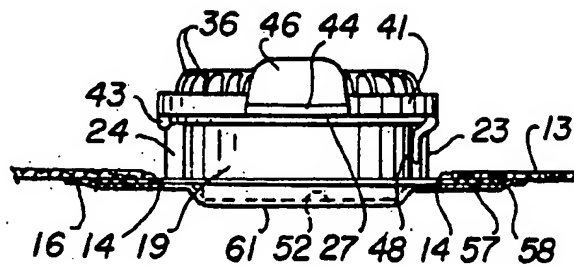


FIG. 8

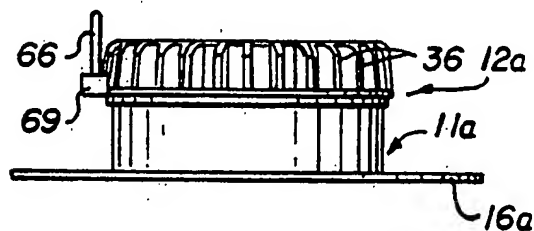


FIG. 9

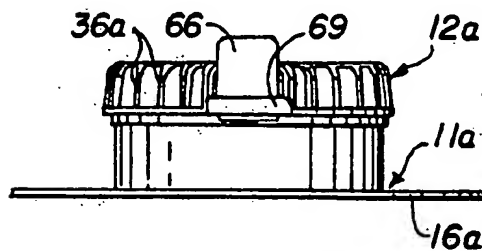


FIG. 10

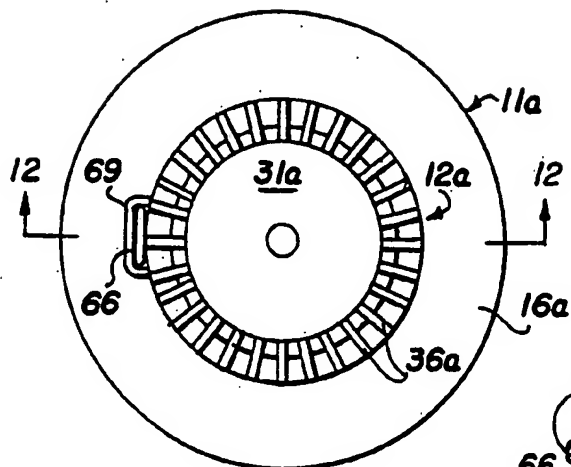


FIG. 11

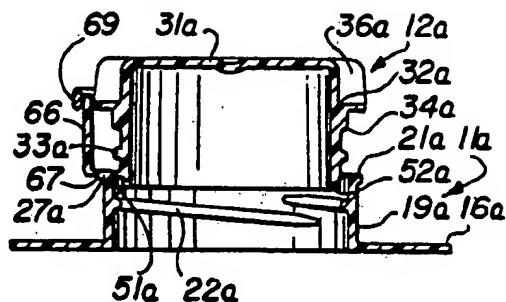


FIG. 12

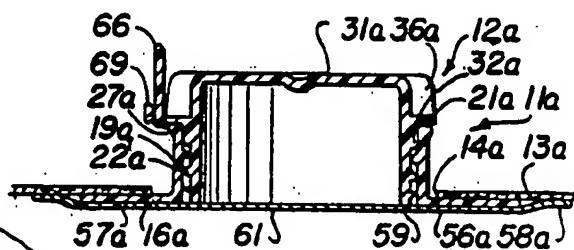


FIG. 13

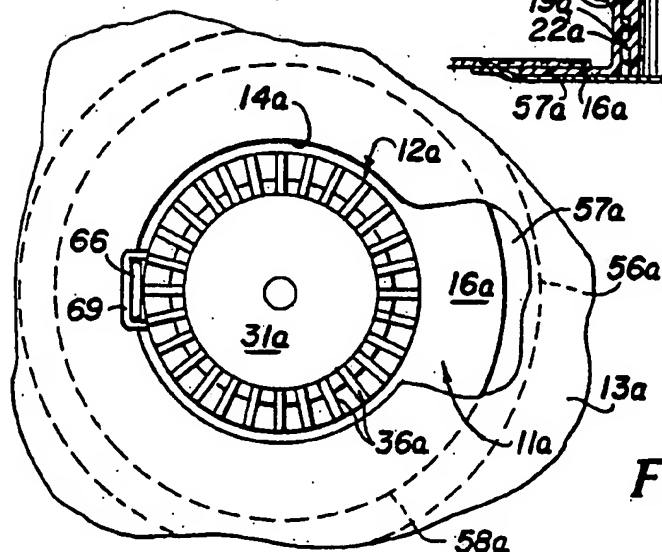


FIG. 14

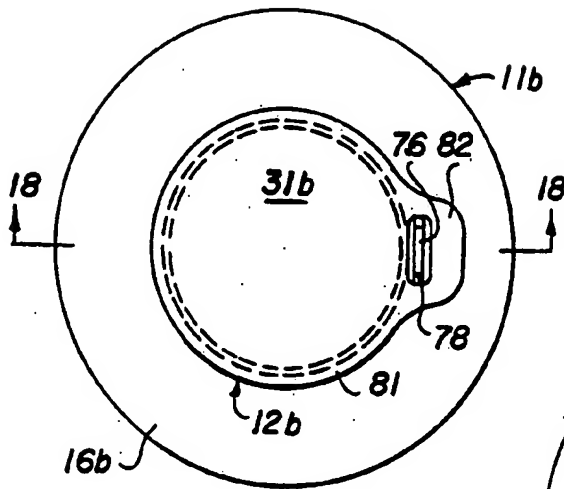


FIG. 15

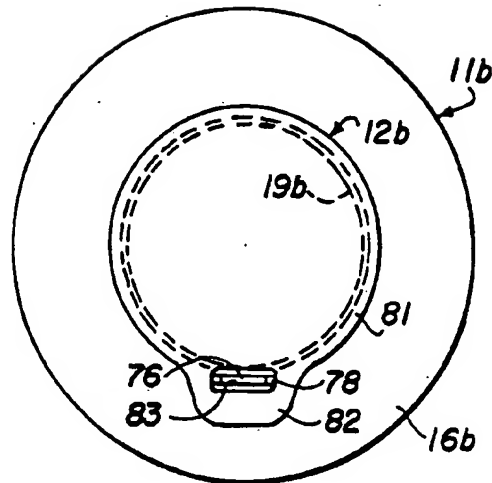


FIG. 16

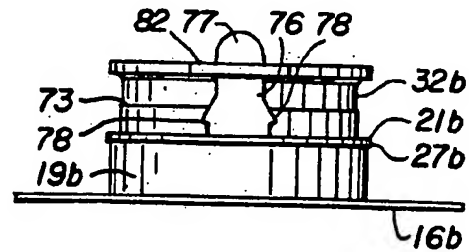


FIG. 17

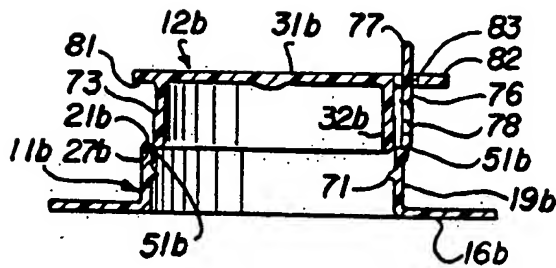


FIG. 18

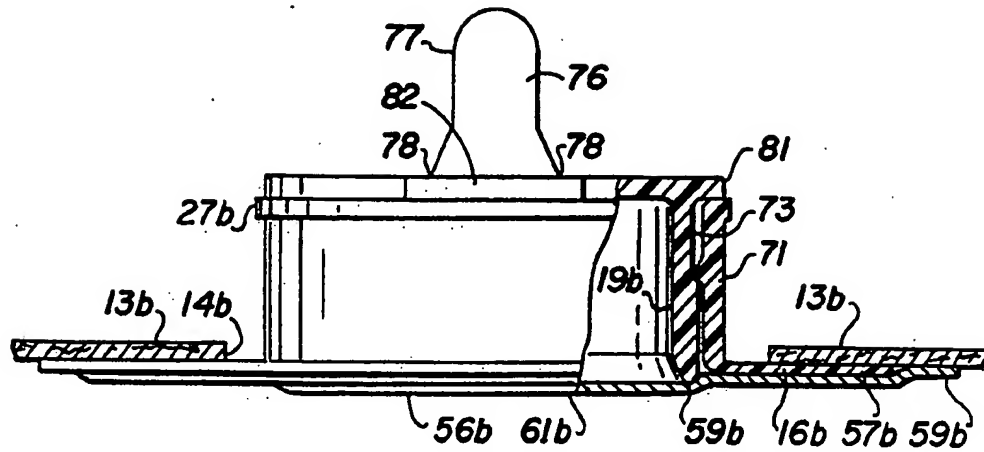


FIG. 19

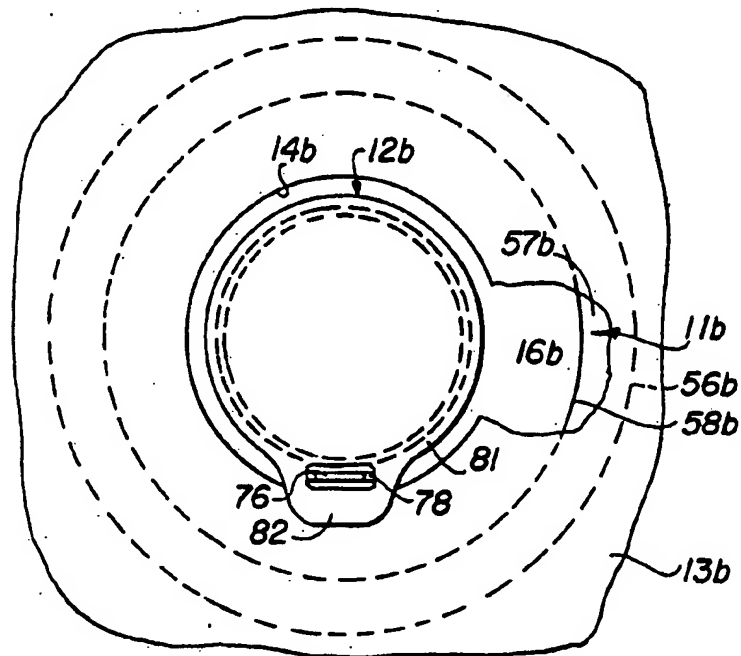


FIG. 20

# ONE-PIECE FITMENT AND PLUG WITH TAMPER-EVIDENT BAND

## CROSS-REFERENCE TO RELATED APPLICATIONS:

This application is a continuation-in-part of U.S. applications Ser. No. 07/664,658, filed Mar. 5, 1991, entitled SPOUT FITMENT CLOSURE PLUG now abandoned and Ser. No. 07/780,774, filed Oct. 22, 1991, entitled ONE-PIECE FITMENT AND CAP WITH TAMPER-EVIDENT BAND now U.S. Pat. No. 5,174,465.

## BACKGROUND OF THE INVENTION

### Field of the Invention

This invention relates to a new and improved spout fitment and a plug type cap for closing same. More particularly, the invention relates to a fitment which fits around a hole in a panel of a paperboard carton or around a hole in a flexible container, or the like, such as used for packaging liquid products and powders and to a closure for such fitment. The invention is further characterized in that it is tamper-evident. Further, in a modification of the invention, it has container sealing features making it useful in aseptic packaging.

### Description of Related Art

Generally speaking, prior fitments have spouts with external threads closed by caps with internal threads. Some fitments are used in conjunction with plastic bag containers, the fitment being integrally welded to the plastic bag. Other prior art fitments are attached to a polymer-coated paperboard container such as a gable-top half-gallon container which, optionally, may be lined with foil or plastic. Generally, prior art fitments for paperboard cartons include a thin flange which is welded to the surface of the container. The closure includes a foil seal which seals the mouth of the spout and a liner for the cap which serves a re-sealing function. Attachment to the polymer coated paperboard is accomplished by welding the flange of the spout to the polymer coating. Upon initial removal, the tamper-evident foil seal is removed and discarded.

Fitments of the prior art have a number of deficiencies as compared to the present invention. In the first place, they employ multiple components which increase the cost of the combination very greatly over the simple structures of the present invention. Secondly, the assembly is difficult and involves rotary equipment which is difficult to control in practice and is expensive to install. Thirdly, because of the fact that the prior art spouts are externally threaded, the diameter of the opening in the spout is restricted inasmuch as there is only limited space on the panel of the container on which the flange can be located, thereby reducing the diameter of the fitment flange and correspondingly the internal diameter of the spout. Fourthly, commercially available fitment-closure combinations have no external tamper-evident features, demonstrated, for example, by the internal foil seal of the spout opening of the prior art. Finally, prior fitment-closure combinations have not been adoptable to aseptic packaging.

The openings in prior container panels have been closed off by barrier layers such as shown in U.S. Pat. No. 4,813,578. Such barrier layers are, however, usually part of the laminate of which the container panel is formed. Portions of the plug or cap are secured to the

barrier so that when the plug is removed, the barrier is fractured, providing access to the interior of the container. The use of the laminate as the barrier involves manufacturing difficulties which do not occur in accordance with the present invention.

All of the foregoing deficiencies are eliminated in the present invention.

## SUMMARY OF THE INVENTION

In accordance with the present invention, a fitment having a spout into which the skirt of a plug fits are provided. Either the spout and plug skirt are formed with mating threads or the telescoping surfaces are so formed that they are liquid-tight when assembled.

In one form of the invention, a foil disk of greater diameter than the flange of the fitment is attached to the under side of the flange by welding and the foil may also be welded to the bottom edge of the plug which fits into the spout of the fitment. The assembled fitment and plug are inserted through the opening in the container panel from the inside of the container and the foil is welded to the under side of the container panel in liquid-tight fashion. This construction is useful in aseptic packaging since the sealing of the foil to the container panel around the opening in the container prevents contamination of the interior of the container after filling.

In one form of the invention, the interior of the fitment is threaded and the plug therefor is externally threaded. Around the plug is a tamper-evident band connected thereto by a frangible line of weakness. Depending from the tamper-evident band are diametrically opposed fingers and extending from the fitment flange are diametrically opposed sockets shaped to receive the plug fingers and so constructed as to restrain unscrewing of the plug so long as the tamper-evident band is intact.

In another form of the invention, a finger projects upward from the fitment spout and the plug is formed with a loop which receives the finger. The plug cannot be unscrewed without removal of the finger, thereby providing evidence of tampering.

In still another form of the invention, wherein the interior of the spout and the exterior of the plug skirt have an interference or liquid-tight fit, the finger extending up from the spout is received in an aperture in a flange of the plug. The finger is formed with tangs which lock against the upper side of the plug flange and prevent removal of the assembled plug and fitment so long as the finger remains intact.

Initially, the plug and fitment are preferably molded in a single mold and the two parts are connected together by frangible gates joining the cap skirt and the upper edge of the fitment spout. Either in the final stage of the molding process or separately, the cap is depressed relative to the fitment by a straight axial push. Where the plug and fitment are threaded, the mating threads of the cap and spout slip over each other in this operation and seat in liquid-tight fashion. At the same time the parts are collapsed, the finger of the fitment is inserted into a socket in the plug. Alternatively, where there is a frangible tamper-evident band on the plug, the depending finger of the band fits into a socket on the flange of the fitment. In assembled position, the cap cannot be removed without giving evidence of tampering. The fitment flange is then attached to the container and the container is filled.

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and form a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention:

FIG. 1 is a side elevational view of the plug and fitment prior to assembly.

FIG. 2 is a view similar to FIG. 1 rotated 90 degrees.

FIG. 3 is a top plan view of the structure of FIG. 1.

FIG. 4 is a top plan view of the structure of FIG. 2.

FIG. 5 is a sectional view taken substantially along the line 5—5 of FIG. 3.

FIG. 6 is a sectional view taken substantially along the line 6—6 of FIG. 4.

FIG. 7 is a view, partially broken away in section, showing the plug assembled in the fitment, and the fitment and an aseptic seal applied to a portion of a container panel.

FIG. 8 is a view similar to FIG. 7 without the device being sectioned.

FIG. 9 is a side elevational view of a modified assembled cap and fitment.

FIG. 10 is a view similar to FIG. 9 rotated 90°.

FIG. 11 is a top plan view of the structure of FIG. 9.

FIG. 12 is a sectional view taken substantially along the line 12—12 of FIG. 11 prior to assembly.

FIG. 13 is a vertical sectional view showing the plug assembled in the fitment and the fitment attached to a container panel.

FIG. 14 is a plan view of the structure of FIG. 13.

FIG. 15 is a top plan view of a further modified plug and fitment prior to assembly.

FIG. 16 is a view similar to FIG. 15 rotated 90°.

FIG. 17 is a side elevational view of the structure of FIG. 16.

FIG. 18 is a vertical sectional view taken substantially along the line 18—18 of FIG. 15.

FIG. 19 is a side elevational view partially broken away in section showing the plug and fitment assembled and installed in a container panel.

FIG. 20 is top plan view of the structure of FIG. 19.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to those embodiments. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims.

In the form of the invention shown in FIGS. 1-8, there are a fitment portion 11 and a plug or cap portion 12. Fitment portion 11 has an annular flange 16 which is attached to the container panel 13 surrounding the hole 14 therein. Panel 13 may be part of a variety of containers, including paperboard cartons, plastic containers, bags and others. Various means may be used to join the flange 16 to the panel 13. Welding the flange to the panel is a preferred choice in the present invention.

Projecting upward from the inside of the flange 16 is a spout 19 having a top edge 21. Internal threads 22 are formed in the spout 19. Spaced outwardly of spout 19

and projecting upward from flange 16 is a socket wall 23 which is parallel to a tangent to the outside of the spout 19. One end of wall 23 is closed off by a radial socket wall end 24. As shown in the accompanying drawings, there are two socket walls 23 diametrically spaced apart. It will be understood that a single socket or more than two sockets may be used. Socket wall 23 has an upward projection 26 which joins the socket end wall 24, as best shown in FIG. 2. The outer wall of spout 19 is formed with an outward projecting peripheral flange 27 immediately below its top edge 21. The flange 27 is continuous except immediately above socket walls 23.

Plug 12 has a top disk 31 from which depends skirt 32, which is formed with external threads 33 to mate with the threads 22. Shoulder 34 is formed at the upper end of the threads 33. External ribs 36 curve from the periphery of top disk 31 downwardly and assist the user in gripping the cap portion 12 to unscrew it from the fitment. Surrounding skirt 32 and spaced outwardly thereof is a horizontal tamper-evident band 41. The lower edge of band 41 is connected to the skirt 32 by frangible bridges 42 which may constitute extensions of the lower edges of ribs 36. Thus the bridges 42 alternate with voids therebetween to form a line of weakness between band 41 and skirt 32. It will be understood that other means may be used to create a line of weakness between the band 41 and the skirt 32. In at least one location, there is an upward-extending pull tab 44 integral with the band 41 and projecting upward so that it may be conveniently gripped by the consumer to tear off the band 41. As a further means to facilitate tearing off the band 41, at least one outward-projecting thumb tab 46 may be provided. Thus the consumer may either grip the tab 44 and pull upward or insert a finger or thumb under the tab 46 and pull upward to remove band 41.

Extending downward from band 41 in one or more locations (here shown as two in number) are tamper-evident fingers 48 which are shaped parallel to a tangent drawn to the exterior of skirt 32. The fingers 48 are joined to the band 41 by downward-inward curved connections 43.

The plug portion 12 and fitment portion 11 are initially connected together by frangible radial lugs or gates 51 joining the edge of skirt 32 to the top edge 21 of spout 19. The lugs or gates are preferably positioned radially to coincide with the projected extension of helical thread 33, so that the gates form an effective thread runout. As illustrated, there are two diametrically spaced lugs 51, subject to variation. This is because the embodiment shown is a double lead thread.

Either during a final ejection stage of the molding process or subsequently, the plug 12 is pushed down so that the skirt 32 slips inside the spout 19. Threads 33 and 22 are so shaped and positioned that they will slip past each other in registration during this downward movement. The fingers 48 are so located with reference to the socket walls 23 that a straight downward push of the plug 12 seats the fingers 48 inside the socket walls 23 and adjacent the socket end walls 24.

End walls 24 prevent the plug 12 from being unscrewed because the fingers 48 abut thereagainst. If one attempts to unscrew the plug 12, the fingers 48 encountering the walls 24 prevent such turning. If the consumer forces turning of the plug 12, fracture of the bridges 42 occurs, thereby giving evidence of tampering.



Directing attention to the structures shown in FIGS. 7 and 8, a foil disk 56 having a diameter greater than that of the flange 16 is initially secured to the underside of flange 16 in a circular pattern by means of a weld 57 or other means of attachment. Optionally, a circular weld 59 may be formed between the foil disk 56 and the bottom edge 52 of the plug skirt 32. The assembled fitment 11 and plug 12 are installed in the container by inserting through the opening 14 in the panel 13. The outer portion of the flange 16 engages the underside of the panel 13 surrounding the opening 14. A weld 58 is formed between the foil 56 and the underside of the panel 13. It will be observed that an aseptic container may be provided since the opening 14 is completely sealed by the disk 61 which also seals the opening in the panel 13. Hence if the container and the contents are sterile when the container is filled and the container is sealed in sterile fashion, an aseptic package results.

In a preferred use of the device, the consumer either pulls upward on tab 44 or raises the tab 46, causing the band 41 to be disconnected from the cap 12 by fracturing the bridges 42. The cap 12 may then be unscrewed. Cap 12, of course, serves as a reclosure cap until the contents of the container are consumed.

In the modification shown in FIGS. 7 and 8 when the plug 12 is unscrewed, the weld between the bottom edge 52 of the skirt 32 causes fracture of the foil 56. The welding of the foil 56 to the bottom edge 52 is optional. Thus if the foil 56 is not removed from the area within the opening of the annular flange 16 when the plug 12 is removed, the presence of the foil is tamper evidence. The consumer may obtain access to the interior of the container by puncturing the foil 56 with a straw or a finger or an instrument such as a knife.

Directing attention now to the form of the invention shown in FIGS. 9-14, and first to FIG. 12, it will be seen that the plug 12a and fitment 11a may be initially molded together. One or more lugs 51a projecting outward from the edge 52a join the inner, upper edge of the rim 27a of the spout 19a. The lugs 51a are subsequently broken when the plug 12a is depressed into the fitment 11a and assumes the position shown in FIG. 13. Finger 66 extends vertically upward and is joined at its lower end by juncture 67 to the outer edge of rim 27a. The juncture 67 is a line of weakness. So long as this line 67 is unbroken, the combination is tamper evident. Loop 69 dimensioned to receive the finger 66 is formed extending out from the upper end of skirt 32a. When the plug 12a is inserted in the fitment 11a, the finger 66 extends up through the loop 69 and prevents unscrewing the plug 12a. The consumer may pull upward on the finger 66 to break the line of weakness 67 and then unscrew the plug 12a or the unscrewing of the plug 12a will cause the finger 66 to break off from the fitment. In either event, the assembly shown in FIG. 13 is tamper evident.

In many respects, the structure of FIGS. 9-14 resembles that of the preceding modification and the same reference numerals followed by the subscript "a" are used to indicate corresponding elements.

Directing attention now to the form of the invention shown in FIGS. 15-20, it will be observed that the plug 12b fits inside the spout 19b with a liquid-tight fit but without the formation of threads. Seal bead 71 on the inside of spout 19b prevents leakage. When the plug is installed inside the spout 19b as shown in FIG. 19, the seal bead 71 engages over the shoulder 73 formed on the exterior of skirt 32b. This prevents the plug 12b from

being unintentionally removed. Finger 76 of this modification is attached to the upper edge of spout 19b at a line of weakness 51b. Finger 76 has a rounded upper end 77 to facilitate insertion in slot 83 formed in ear 82 which projects out from the flange 81 of the top 31b of plug 12b. Outward projecting tangs 78 are formed on finger 76. When the parts are assembled the tangs 78 are above ear 82 (see FIG. 19), preventing removal of the plug without removing finger 76 and giving evidence of tampering. In other respects, the modification of FIGS. 15-20 resembles that of the preceding modifications and the same reference numerals followed by the subscript "b" are used to indicate the corresponding elements.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the claims appended hereto and their equivalents.

What is claimed is:

1. In combination, a fitment and a plug therefor said fitment being shaped to seal around an aperture in a panel of a container, said panel having inside and outside surfaces around said aperture,

said fitment comprising an annular flange shaped to fit around said aperture having top and bottom surfaces, said top surface being dimensioned and shaped to be secured to said inside surface, a hole in said flange, a spout upstanding from said flange surrounding said hole, and first attachment means on said spout,

said plug having a top, a skirt depending from said top, second attachment means on said skirt cooperable with said first attachment means to detachably secure said plug on said fitment,

characterized by first tamper-evidencing means on said plug, second tamper-evidencing means on said fitment cooperable with said first tamper-evidencing means to prevent movement of said plug relative to said fitment so long as both said tamper-evidencing means are intact, and a seal member dimensioned larger than said flange secured to said bottom surface of said flange and dimensioned and shaped to be secured to said inside surface of said panel outside an outer edge of said flange, said seal member being unconnected to said panel except outside said flange.

2. The combination of claim 1 in which said first tamper-evidencing means comprises a ring around said plug, frangible means frangibly connecting said ring to said plug, and at least one narrow finger depending from said ring and said second tamper-evidencing means comprises at least one socket on said flange shaped and positioned to receive said at least one finger.

3. The combination of claim 2 in which said frangible means comprises thin bridges separated by spaces extending inward from said ring to said skirt.

4. The combination of claim 2 which further comprises a pull tab fixed to and extending upwardly from

said ring, whereby pulling said tab breaks said frangible means.

5. The combination of claim 2 which further comprises a thumb tab extending substantially horizontally outward from said ring, whereby lifting said thumb tab breaks said frangible means.

6. The combination of claim 2 wherein said first and second attachment means comprise interfitting threads.

7. The combination of claim 1 in which said seal member is metallic foil.

8. The combination of claim 1 in which said seal member is attached to a lower edge of said skirt.

9. The combination of claim 1 and a container formed with an aperture, said seal member being attached in aseptic manner to said container.

10. In combination, a fitment and a plug therefor said fitment being shaped to seal around an aperture in a surface of a panel of a container,

said fitment comprising an annular flange shaped to fit around said aperture, a hole in said flange, a spout upstanding from said flange surrounding said hole, and first attachment means on said spout,

said plug having a top, a skirt depending from said top, second attachment means on said skirt cooperable with said first attachment means to detachably secure said plug on said fitment,

characterized by first tamper-evidencing means on said plug, second tamper-evidencing means on said fitment cooperable with said first tamper-evidencing means to prevent movement of said plug relative to said fitment so long as both said tamper-evidencing means are intact, and a foil seal member dimensioned larger than said flange and dimensioned and shaped to be secured to said panel outside an outer edge of said flange,

said first tamper-evidencing means comprising a ring around said plug, frangible means frangibly connecting said ring to said plug, a finger depending from said ring and said second tamper-evidencing means comprising a socket on said flange shaped and positioned to receive said finger, said finger being rectangular in cross-section, the width of said finger being positioned parallel to a horizontal tangent to said skirt.

11. The combination of claim 10 in which said socket comprises a vertical socket wall disposed outwardly relative to said finger.

12. The combination of claim 11 in which said socket wall is substantially parallel to a tangent to said spout.

13. In combination, a fitment and a plug therefor said fitment being shaped to seal around an aperture in a surface of a panel of a container,

said fitment comprising an annular flange shaped to fit around said aperture, a hole in said flange, a spout upstanding from said flange surrounding said hole, and first attachment means on said spout,

said plug having a top, a skirt depending from said top, second attachment means on said skirt cooperable with said first attachment means to detachably secure said plug on said fitment,

characterized by first tamper-evidencing means on said plug, second tamper-evidencing means on said fitment cooperable with said first tamper-evidencing means to prevent movement of said plug relative to said fitment so long as both said tamper-evidencing means are intact, and a foil seal member dimensioned larger than said flange and dimensioned and shaped to be secured to said panel outside an outer edge of said flange, and frangible means initially frangibly interconnecting said plug and said fitment whereby said plug and said fitment may be injection molded in one piece.

14. In combination, a fitment and a plug therefor said fitment being shaped to seal around an aperture in a surface of a panel of a container,

said fitment comprising an annular flange shaped to fit around said aperture, a hole in said flange, a spout upstanding from said flange surrounding said hole, and first attachment means on said spout,

said plug having a top, a skirt depending from said top, second attachment means on said skirt cooperable with said first attachment means to detachably secure said plug on said fitment,

characterized by first tamper-evidencing means on said plug, second tamper-evidencing means on said fitment cooperable with said first tamper-evidencing means to prevent movement of said plug relative to said fitment so long as both said tamper-evidencing means are intact, and a foil seal member dimensioned larger than said flange and dimensioned and shaped to be secured to said panel outside an outer edge of said flange,

said first tamper-evidencing means comprising a ring around said plug, frangible means connecting said ring to said plug, a finger depending from said ring and said second tamper-evidencing means comprising a socket on said flange shaped and positioned to receive said finger, said finger being initially positioned immediately above said socket whereby axial movement of said plug toward said fitment without rotation seats said finger in said socket.

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**Galer**

[11] **Patent Number:** **4,625,890**  
[45] **Date of Patent:** **Dec. 2, 1986**

[54] **SAFETY CLOSURE FOR OPEN HEAD CONTAINERS**

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*Primary Examiner*—George T. Hall

[21] **Appl. No.:** **785,783**

[57] **ABSTRACT**

[22] **Filed:** **Oct. 9, 1985**

A safety closure for an open head container, having an improved cap assembly comprising a plastic cap and locking ring, the plastic cap including a central web, a sealing ring and a plurality of lugs around it having inwardly protruding flanges to engage the lower portion of a chime on the container, the locking ring extending over the sealing ring and engaging a lower peripheral surface of the sealing ring.

[51] **Int. Cl.<sup>4</sup>** ..... **B65D 45/32**

[52] **U.S. Cl.** ..... **220/319; 220/306**

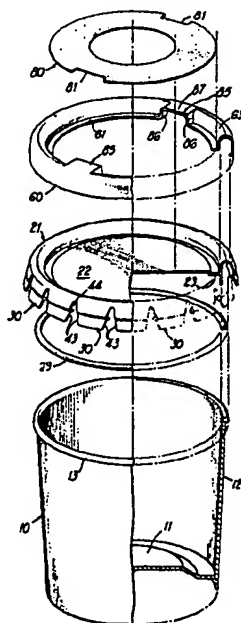
[58] **Field of Search** ..... **220/319, 320, 306; 150/55; 292/256.65**

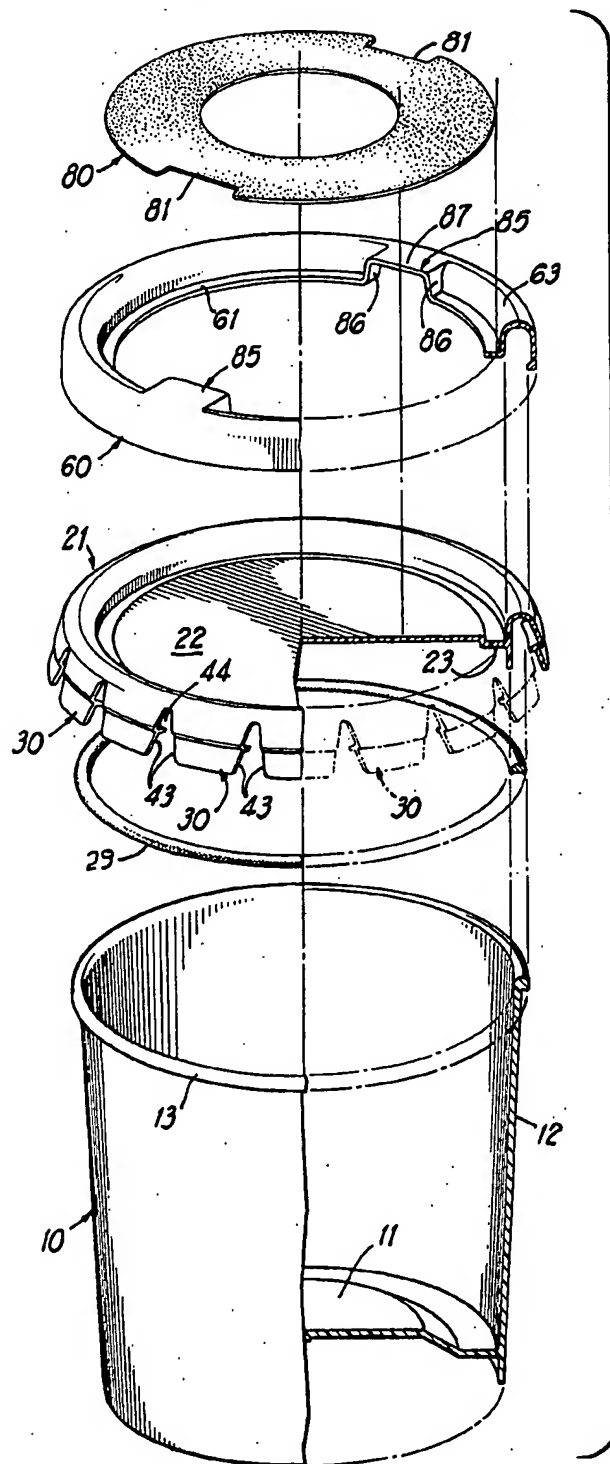
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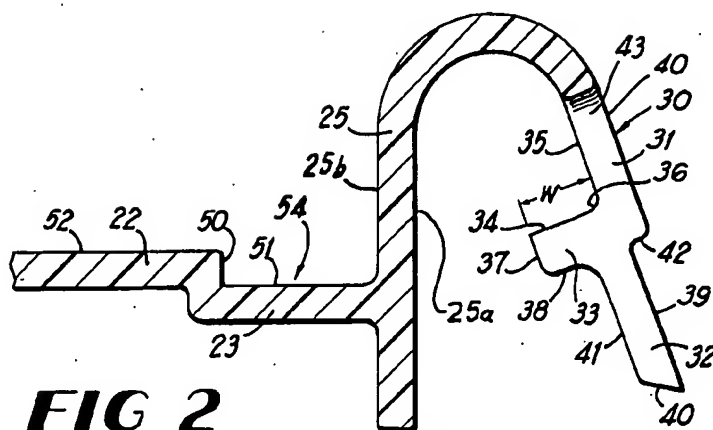
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**10 Claims, 5 Drawing Figures**

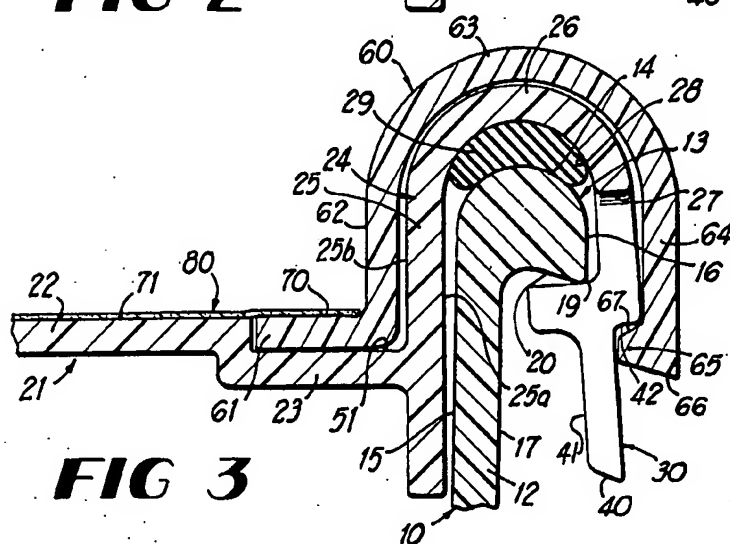




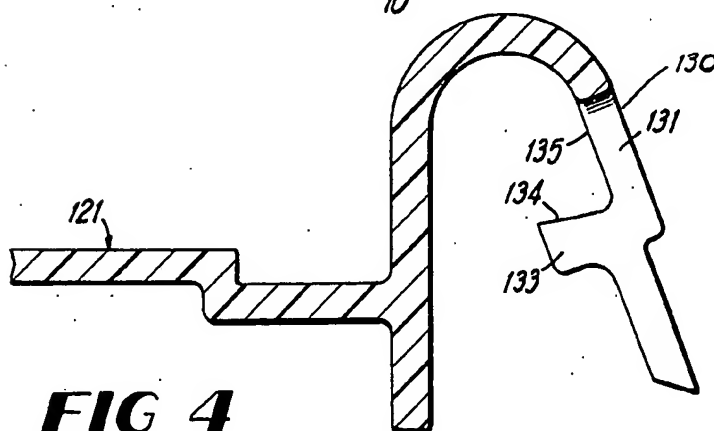
**FIG. 1**



**FIG 2**

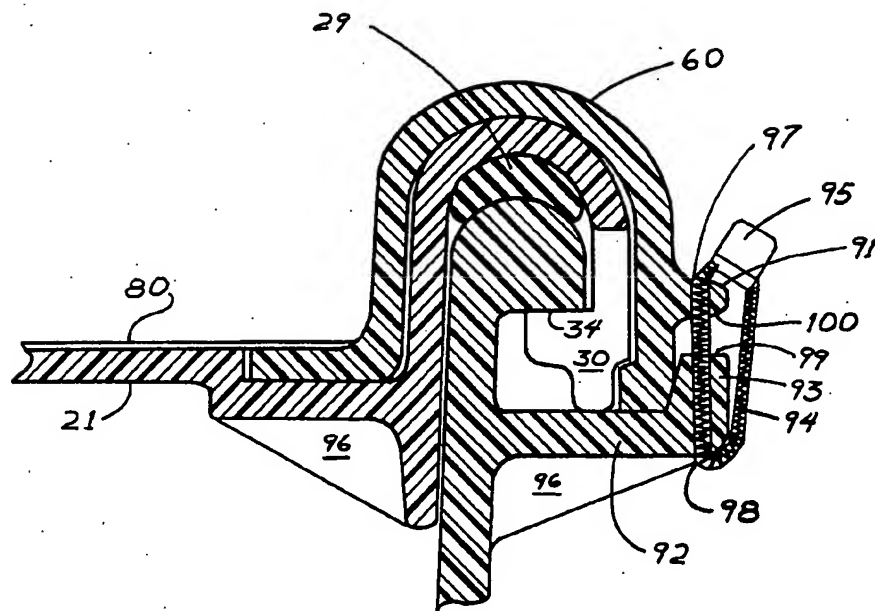


**FIG 3**



**FIG 4**

**FIG 5**



## SAFETY CLOSURE FOR OPEN HEAD CONTAINERS

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to a container with a removable cap or lid and is more particularly concerned with a closure assembly for an open top container.

#### 2. Description of the Prior Art

In the past, numerous containers having a volume of an pint or more, i.e. up to several gallons or more, have been devised in which a lid or cap is secured by means of flanges which engage below the chime of the open top container. If the cap or lid is molded from plastic, the maximum dimension or undercut for the lip of a snap-on-cap or lid for a typical one-gallon container is usually about 0.100 inch (about 2.5 mm) because the lid or cap must be stripped from the plastic mold. Plastic molded containers have not generally been successful in withstanding impact or shock such as may occur if the container is dropped. The relatively insecure seal between the lid and container has been a particular weakness of interest to government regulatory bodies concerned with accidental spills of toxic or corrosive materials. The seal should be secure when it is replaced after a partial use for dispensing, for example a swimming pool chlorinating compound which may continue to be of interest to curious children.

The present invention eliminates the problem of an insecure seal and provides a closure assembly which quite firmly locks a lid on the container and yet permits its ready removal from the container and secure replacement.

### SUMMARY OF THE INVENTION

Briefly described, the present invention includes a closure having a container provided with an open cylindrical top. An annular chime at the rim or upper peripheral edges of the container protrudes outwardly from the body of the container and is provided with a lower upwardly tapered annular surface. A snap-on-cap assembly closes the top of the container, the cap being an integrally molded plastic member having a central web or circular disc surrounded by a downwardly opening sealing ring, the outer periphery of which is provided with circumferentially spaced, downwardly and outwardly protruding lugs.

Each lug has an inwardly protruding locking lip or flange which engages the peripheral shoulder of the chime of the container. A locking ring clamps over the sealing ring and a tamper indicating ring is received over the surface of the disc and locking ring.

Accordingly, it is an object of the present invention to provide a snap-on-cap lid assembly for a container which is inexpensive to manufacture, durable in structure and efficient in operation.

Another object of the present invention is to provide a closure for an open top container which can be molded using injection molding and which can be readily and easily stripped from the mold using a stripping ring and yet provides a locking lip which will sufficiently lock the cap in place so that it cannot be tampered with or readily removed.

Another object of the present invention is to provide a closure for an open top container which can be readily

opened and which can also be readily closed when desired.

It is highly desirable, when the container holds a toxic or corrosive chemical such as the chlorine-containing compounds commonly used for treating home swimming pools, that after the container is reclosed it should be difficult for a child to reopen. This is another object of the present invention.

Another object of the present invention is to provide a closure assembly for an open top container which will place an O-ring in compression between the rim of the container and the cap or lid of the assembly.

Another object of the present invention is to provide a container closure system that does not require a gasket even when the container holds powders and some viscous liquids.

Another object of the present invention is to provide a closure assembly having a molded plastic cap with a locking surface which is adequate to assure that the lid assembly cannot be readily removed from the container and will not be easily dislodged even if the container is subjected to rough handling during transport, and/or to long term warehouse conditions.

Other objects, features and advantages of the present invention become apparent from the following description when taken in conjunction with the accompanying drawings wherein the characters referenced designate corresponding parts throughout the several views.

### DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of a container constructed in accordance with the present invention;

FIG. 2 is enlarged fragmentary vertical sectional view of a portion of the cap or lid of the container shown in FIG. 1;

FIG. 3 is an enlarged fragmentary vertical sectional view of a portion of the rim of the container with the lid assembly installed thereon;

FIG. 4 is a fragmentary vertical sectional view similar to FIG. 2 and showing a modified form of the present invention;

FIG. 5 is a fragmentary vertical section view of a variation of my invention having additional flange and prying means for locking and convenient opening, and an additional tamper-evident feature.

### DETAILED DESCRIPTION

Referring now in detail to the embodiment chosen for the purpose of illustrating the present invention, numeral 10 in FIG. 1 denotes generally a bucket or container having a bottom 11 and an upstanding cylindrical or downwardly tapered wall 12, the upper end of which terminates in an open top defined by an outwardly protruding annular rim or chime 13. As seen in FIG. 3, the upper edge portion of the chime 13 in cross-section is convex to provide a curved upwardly and outwardly protruding surface denoted by the numeral 14. This surface 14 on its inner side merges with the inner surface 15 of the wall 12. The upper surface 14 also merges on its outer side with the outer surface 16 of the chime 13. The outer surface 16 is spaced outwardly from the outer surface 17 of the wall 12 and is disposed generally concentric to the walls 15 and 17. A lower annular lip 20 forms the bottom portion of the chime 13, this lip 20 tapering outwardly and downwardly and merging at an outer annular edge 19 with the outer wall 16 of the chime 13. The inner edge portion of the lip 20 curves

inwardly and downwardly in an arcuate fashion to merge with the outer wall 17.

Referring again to FIG. 1, the lid or cap assembly includes a cap denoted generally by the numeral 21, this cap 21 having a flat central disc shaped web 22 which extends across essentially the entire mouth of the container 10 when the container is closed. The periphery of the web 22 is integrally joined in an annular support ring 23 which is disposed in a plane below the plane of the web 22. As seen more clearly in FIG. 3, the inner peripheral portion of the support ring 23 carries the outer peripheral portion of the web 22 while the outer periphery of the support ring 23 is integrally joined to an intermediate portion of the inner wall member 25 of an upstanding sealing ring denoted by the numeral 24. This sealing ring 24 opens downwardly. The inner wall member 25 of the sealing ring 24 is generally cylindrical and has an outer surface 25a which conforms to and fits snugly against and within the inner surface 15 of the container 12 when the cap 21 is appropriately placed for closing the open upper end of the container 10.

The upper edge portion of the inner wall 25 integrally merges with an annular top portion 26 which extends over the upper surface 14 of the chime 13, the annular top portion 26 being essentially semi-cylindrical in cross section, as shown in FIG. 3, and terminating at a lower edge 27 which is spaced above the upper edge portion of the outer wall 16 but below the upper extremity of the surface 14. The inner surface 28 of the annular top portion, in cross-section is concaved and conforms generally to the shape of the upper surface 14, being slightly larger in cross-sectional diameter than the surface 14. Thus, an O-ring 29 placed on upper surface 14 can be clamped in compression as shown in FIG. 3 between the surface 28 and the surface 14 when the lid assembly is installed on container 10.

Protruding downwardly from the edge 27 are a plurality of circumferentially equally spaced locking lugs 30 which are arranged adjacent to each other circumferentially around the cap 21. Each locking lug 30 is substantially identical and when molded protrudes at an angle outwardly and downwardly from the top portion 26, as illustrated in FIG. 2 at an angle of from 10° to 70° to the vertical axis. Each lug 30 includes a body 31 which carries a releasing lever 32 as an extension of the body 31, the releasing lever 32 being integrally formed with and spaced downwardly from the body 31.

Protruding inwardly from the lower end portion of the body 31 is a locking lip 3 which has a relatively wide flat upper or locking surface 34 which merges along a concaved portion 36 with the vertical inner surface 35 of the body 31. This flat locking surface 34 has any reasonable width W and terminates at the inner edge 36 of the ledge 33. The inner vertical surface 35 protrudes downwardly forming a locking surface extremity 37 and then curves outwardly to merge with the bottom surface 38 of the locking ledge 33, this bottom surface, in turn, curving downwardly and merging with the inner surface 41 of the lever 32. The inner surface 41 is offset inwardly from the inner surface 35 of the body 31 and protrudes downwardly to merge with a stripper ring engaging surface 40 which is disposed at an obtuse angle to the surface 41 as shown in FIG. 2 and FIG. 3. This stripper ring engaging surface or lower surface 40 protrudes outwardly and merges with the outer surface 39 of the lever 32.

The upper edge portion of the outer surface 39 terminates at the inner edge of a shoulder 42 which is dis-

posed essentially in a common place with the bottom surface 38 and this shoulder 42 protrudes outwardly and then curves upwardly to merge with the outer surface 40 of the body 31.

Referring to FIG. 1, it is seen that each of the lugs 30 is provided with a pair of side edges 43, the side edges of adjacent lugs tapering upwardly to provide a generally triangular space 44 therebetween which is adapted to receive a screwdriver when the lid is to be removed by being pushed off.

Referring now to the FIG. 2, it will be seen that the web 22 has an outer periphery 50 which is a cylindrical surface above the support ring 23. The lower edge of the outer periphery 50 terminates at the inner periphery of the flat annular upper surface 51 of the support ring 23, this upper surface 51 terminating at the surface 25b. Thus, the surfaces 50, 51 and 25b define an annular recess 54 which receives the inner annular flange 61 of a locking ring 60. The inner flange 61 has an outer periphery which is integrally joined to an upstanding inner wall 62 of the locking ring 60. This inner wall 62 is adapted to be received against the upper portion of wall 25b when the locking ring 60 is installed.

It will be understood that the locking ring 60 is a downwardly opening annular member which include an annular outer wall 64 which is generally concentric with and outward from the wall 62. Between the wall 64 and the wall 62 is a downwardly opening curved top portion 63 which, in cross section, is essentially semi-cylindrical and extends over the top portion 26 when the locking ring 60 is installed. At the lower edge portion of the outer annular wall 64 is an inwardly protruding rim 65 having a downwardly tapered lip engaging surface 67. The bottom surface 66 of the lip 65 is adapted to engage below the ledge 42 when the locking ring 60 is installed as shown in FIG. 3.

When the locking ring 60 is installed over the sealing ring 21, it cams all of the lugs 30 simultaneously inwardly so that the surface 34 is cammed along the outer corner 19 so as to terminate in the position shown in FIG. 3 beneath the lower surface 20 of the chime 13. When the locking ring 60 is fully installed on the sealing ring 24 the annular flange 61 is seated on the surface 51 and is received within the recess 54 so that its upper surface 70 is in a common plane with the upper surface 71 of the web 22 as shown in FIG. 3. The annular rims 65 hold all of the lugs 30 in an inwardly deformed position so that the surfaces 34 of all lugs act against the edges 19 to compress the O-ring 29 into a deformed position as shown in FIG. 3.

As shown in FIG. 1, the flange 61 is interrupted at diametrically opposed positions so as to be connected by end portions to upwardly inclined opposed pairs of sidewalls which define openings of opposed lifting handles 85. The upper ends of these sidewalls 86 merge with the ends of flat top plates 87 which are disposed in a common plane at about the upper extremity of the sealing ring. Thus, a person may insert his fingers into the space defined by the walls 86 and the plate 87 of each of the respective handle recesses and thereby remove the locking ring 60, thus providing an alternate means of removing the locking ring.

To ensure that the lid has not been previously opened, a tamper sheet 80 which is a sheet of paper or fiber board formed as an annulus is sealed by adhesive against the surfaces 70 and 71 (FIG. 3) after the locking ring has been installed on the sealing ring.



The outer peripheral portion of the sheet 80 is provided with a pair of diametrically opposed indentations 81 so that the sheet 80 will fit over the handles 85.

FIG. 4 shows a modified form of the present invention in which the cap 121 is identical to the cap 21 for the lugs 130 of the sealing ring wherein the locking lip 133 has a locking ledge 134 which is disposed at an acute angle to the inner surface 135 of the body 131. Thus, when urged beneath the chime 13, this lip or ledge 134 will be disposed in an upwardly inclined surface or shoulder 20 of the chime so as to essentially lock the locking ring in place. Thus even if the locking ring 60 is removed, the lugs 130 will not spring outwardly until urged by the lever 130.

In use, the container 10 is filled, and the O-ring 29 is placed within the cap 21. The O-ring is retained within the cap because the O-ring has a cross-sectional diameter greater than the distance between surface 37, and surface 25a. The cap with the O-ring is placed over the top chime of the container. The locking ring 60 is then placed on top of cap sealing ring and urged down onto the sealing ring until it snaps into position. The tamper-evident sheet 80 which may contain a printed label is then glued in place over web 22 and the flange 61. Thus, all lugs 30 are cammed inwardly and locked. In opening, depending on the amount of engagement of locking surface 67, either fingers or a screwdriver may be used to remove the locking ring 60. Removal of the locking ring tears the tamper-evident seal 80. Once the locking ring is removed, the lid is lifted off by grasping the several lugs and lifting outward and upward simultaneously.

The variation in FIG. 5 shows a lug 30 having a somewhat different shape in that it has a flat surface 34 and does not have an elongated lever 32 as in FIGS. 2, 3, and 4. This is to make room for peripheral locking flange 92 which extends radially beyond both lugs 30 and outer wall 64 of locking ring 60, terminating in an upwardly extending rim 93. Locking ring 60 also has a peripheral pry flange 91 in proximity to the terminus 99 of locking flange 92 in order to provide opposing surfaces 100 and 99 for leverage. The locking flange with upward rim 93 will prevent the outward flexing of locking ring 60 if the container is stressed as by dropping.

The embodiment of FIG. 5 also shows an optional seal wire 94 passing through holes 97 and 98 in the pry flange 91 and rim 93; the wire may have a seal 95, but in any case will preferably be of a unique design not easily replaced and will of course act as additional evidence of tampering. Reinforcing ribs 96 may be spaced around the container wall and cover.

When constructed properly, my novel container can be easily reclosed by replacing the locking ring on the sealing ring; when properly replaced, the container will again meet the existing government standards for resistance to shock and re-opening either by accident or purposely.

The cap is preferably molded in a mold in which the lugs are disposed at an incline or obtuse angle to the web and are pivoted outwardly when the cup is stripped from the mold.

The lugs are preferably molded at an incline in the mold so that a stripper ring can urge the lugs outwardly in stripping the cap from the mold.

It will be obvious to those skilled in the art that many variations may be made in the embodiment here chosen for the purpose of illustrating the present invention

without departing the scope thereof as defined by the appended claims.

I claim:

1. A closure assembly of the type having a container with a removable lid, said container having a sidewall and being substantially cylindrical and open at its top portion, said container having a chime carried by said wall and circumscribing said top portion, said chime protruding radially outwardly of the wall of said container and having a shoulder along its bottom portion, wherein the improvement comprises a removable plastic cap assembly for closing said open top, said cap assembly including:

(a) a removable plastic cap having (i) a central web for extending over said open top portion of said container when said cap is placed on said container, said web having a substantially circular periphery, (ii) a sealing ring fixed to said periphery of said web, said sealing ring being downwardly opening and having an annular top portion for extending over the rim of said chime when said cap closes the top portion of said container, and (iii) a plurality of lugs carried by the outer portion of said top portion, said lugs being circumferentially spaced around the periphery of said top portion of said cap for extending around said chime, each of said lugs having an inwardly protruding flange for protruding beneath a portion of said chime when said cap closes said container and said lug is moved inwardly toward said container, said lugs normally extending downwardly and outwardly from said top portion of said cap; and

(b) locking ring for extending over said top portion of said sealing ring, said locking ring opening downwardly and having an inwardly extending lip for engaging beneath a portion of said sealing ring when said sealing ring is disposed beneath a portion of said locking ring, said lugs having portions which protrude downwardly between said lip of said locking ring and said wall of said container and terminating below said locking ring.

2. The closure assembly defined in claim 1 wherein said central web member includes an annular support flange secured to said sealing ring and a central web spaced inwardly from said sealing ring and supported by said support member, said central web being offset upwardly from said support member for defining an annular recess between the periphery of said web and said sealing ring and wherein said locking ring includes an inwardly protruding annular flange received within said recess and means extending over said annular flange for indicating when the annular flange has been moved with respect to said web.

3. The closure assembly defined in claim 1 wherein said locking ring has inwardly opening opposed handles along the inner portion of said locking ring.

4. The closure assembly defined in claim 1 wherein said lugs are normally inclined at an angle of between 10° and 70° and wherein said lugs are biased inwardly when said locking ring extends over the top portion of said sealing ring.

5. The closure assembly defined in claim 1 wherein said lugs include shoulders on the outer surfaces of said lug intermediate the ends of said lug and wherein said lips extend below said shoulders when said locking ring is installed over said sealing ring.

6. The closure assembly defined in claim 1 wherein adjacent lugs include sides which taper upwardly and

terminate within said locking ring for receiving a lever therebetween to assist in removing said locking ring from said sealing ring.

7. The closure assembly defined in claim 1 including an O-ring between said sealing ring and said top chime of container, said O-ring being under compression when said locking ring is fully installed on said sealing ring.

8. The closure assembly of claim 1 including a peripheral locking flange on said container wall having a peripheral upwardly extending rim extending beyond and adapted to make contact with the lower terminus of the plastic cap.

9. The closure assembly of claim 1 including a peripheral locking flange having a peripheral upwardly extending rim adapted to contain the lower terminus of the plastic cap, and a peripheral prying flange above and in proximity to said locking flange to provide mutually opposing surfaces.

10. The closure assembly of claim 1 including a locking flange on said container wall adapted to contain the lower terminus of the plastic cap, a peripheral prying flange on said container wall above and in proximity to said locking flange, having at least one tamper-evident sealing means connecting said locking flange and said prying flange.

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# United States Patent [19]

Summers et al.

[11] Patent Number: 4,534,481

[45] Date of Patent: Aug. 13, 1985

[54] SNAP-ON, TAMPER-EVIDENT CONTAINER CLOSURE

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[73] Assignee: Rieke Corporation, Auburn, Ind.

[21] Appl. No.: 636,910

[22] Filed: Aug. 2, 1984

[51] Int. Cl.<sup>3</sup> ..... B65D 41/48; B65D 41/32

[52] U.S. CL ..... 215/253; 215/255;  
215/256; 215/321

[58] Field of Search ..... 215/254, 250, 253, 255,  
215/256, 305, 317, 321; 220/265, 266, 306, 356

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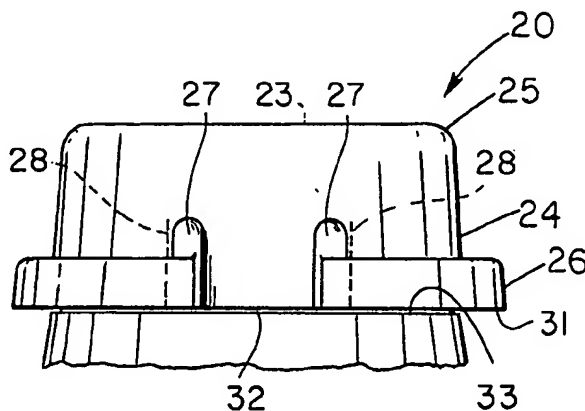
Primary Examiner—Steven M. Pollard

Attorney, Agent, or Firm—Woodard, Weikart, Emhardt & Naughton

## [57] ABSTRACT

A flexible, snap-on closure for use in combination with a container neck in order to seal closed a container in a tamper-evident manner includes a flexible closure having a top surface, a cylindrical side wall, an inwardly protruding annular rib and an inwardly opening annular channel. The container neck is compatibly configured with a top rim defining the container opening and an outwardly opening annular channel disposed below the top rim such that the annular rib is configured to fit within the outwardly opening channel and the inwardly opening annular channel is configured to snugly receive the top rim. The closure further includes a bail handle attached to the side wall by means of two attachment ribs which are integral with the bail handle. The side wall of the closure includes score lines, there being one line on opposite sides of each attachment rib, such that upward lifting on the bail handle which is attached to the side wall by means of three frangible elements, results in the breaking of those frangible elements and the severing of the score lines such that the lower portion of the closure side wall is flared outwardly in order for the closure to be removed from the container neck. The closure has an increased axial height which is sufficient relative to its diameter to prevent removal of the closure without some disruption of the closure.

12 Claims, 6 Drawing Figures



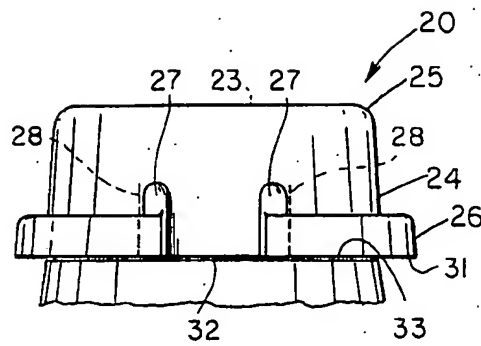


Fig. 1

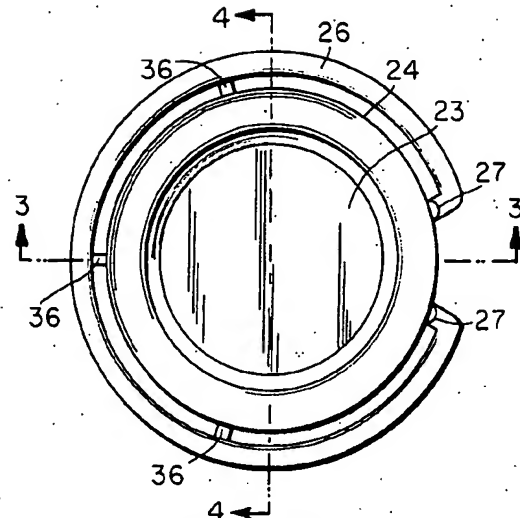


Fig. 2

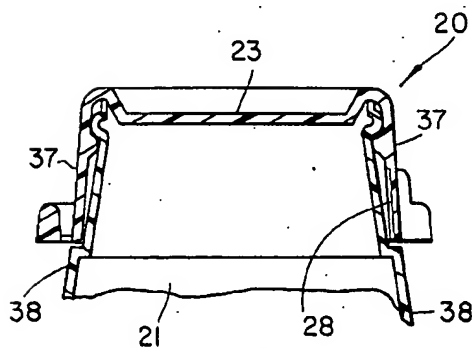


Fig. 3

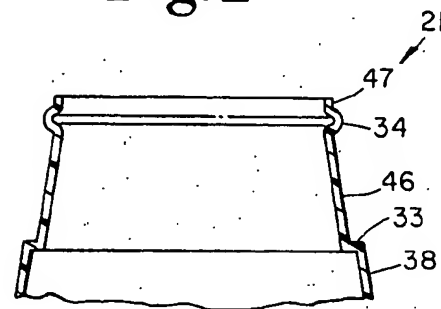


Fig. 5

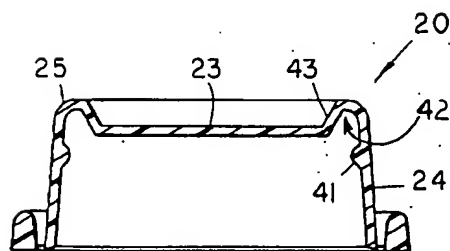


Fig. 4

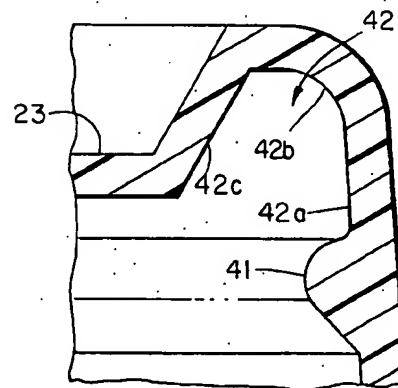


Fig. 4A

# SNAP-ON, TAMPER-EVIDENT CONTAINER CLOSURE

## BACKGROUND OF THE INVENTION

This invention relates in general to plastic closures for containers and more particularly to such closures which are designed for snap-on assembly and which include a tamper-evident feature.

The container closure art is quite crowded with numerous styles of closures, many with very limited and specialized purposes. One small segment of that art includes those closures which are intended to cooperate with the corresponding container, not by threaded engagement, but rather by snapping onto the neck of the container. So long as the mutually engaging portions have a correct size and positional location, a very tight and secure seal can be established without the need for threaded engagement.

Another segment of the closure art which is applicable to threaded engagement closures as well as snap-on closures includes those closures with some type of tamper-evident feature. A tamper-evident feature is used to alert the end user or recipient of the container that the contents may have been tampered with at some earlier point in time. By constructing a closure which cannot be defeated for access to the contents of the container without showing that it has been defeated or at least tampered with, the end user or recipient is assured that the contents are unaltered if the closure does not reveal any tampering. Concerns over tampering are solved by means of the present invention which offers a snap-on, pull-off closure which cannot be defeated as initially applied to the container, for access to the container contents, without showing, by the appearance of the closure, that tampering has occurred. The present invention includes a bail handle attached to the body of the closure by means of attachment ribs which are bounded by a pair of score lines (one adjacent each rib) disposed on the inside of the closure body skirt. The increased axial height of the closure relative to its diameter in combination with an abutment surface on the container neck assures that the closure cannot be pried off without showing evidence of such prying attempts. If prying off of the closure is attempted, the score lines will be partly severed or the lower edge of the closure marred or torn, all of which reveal that an attempt to tamper with the container contents has been made. Further, by disposing the majority of the bail handle at a location contiguous to the lower edge of the container body, and by attaching this bail handle to the container body by means of a plurality of frangible elements, any attempt to pry off the closure will by necessity push upwardly on the bail handle, causing one or more of the frangible elements to fracture, thereby indicating that an attempt has been made to tamper with the contents of the container.

When it is intended to remove the closure of the present invention from the neck of the container, the bail handle is pulled upwardly thereby severing each of the frangible elements and with continued pulling in an upward direction, the attachment ribs act to sever the score lines and thereby allow the lower portion (skirt) of the closure body to flare outwardly, effectively increasing its diameter, thus enabling the closure to be pulled off of the container neck.

While certain prior art references exist, none are believed to anticipate nor to render obvious the present

invention. However, it may be deemed that one or more of such references are relevant to the present invention and thus these various references are set forth below.

| U.S. Pat. No. | Patentee        |
|---------------|-----------------|
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| 3,902,621     | Hidding         |
| 3,952,901     | Conti           |
| 4,227,619     | Magnusson       |
| 4,320,843     | Dubach          |
| 3,976,215     | Smalley         |
| 4,197,960     | Walter          |
| 3,462,035     | Grussen         |
| 3,690,499     | Westfall et al. |

Crisci discloses a snap-on bottle cap for a container having a neck configuration which includes an annular shoulder over which the bottle cap is engaged so as to be self-retaining thereon. The bottle cap is formed of resilient material permitting distortion of the cap when it is applied to the bottle. A ring is positioned around and fastened to an annular flange of the cap by a plurality of frangible elements and it is attached to a portion thereof separated from the remainder by spaced cut-away areas. The ring thus may be used as a pull ring to free the portion of the annular flange as necessary in removing the cap by permitting the remainder of the cap to expand circumferentially so as to become disengaged from the annular shoulder on the neck portion of the bottle.

Hidding discloses a tamper-proof cap structure which includes a cap, a locking ring and a handle and is intended for use with a bottle or similar container having one or more teeth fashioned adjacent a reduced bottle neck. The cap structure locking ring is provided with one or more pawls positioned to mate with the container neck teeth to prevent the cap from being unscrewed from the container. Frangible connectors which rigidly connect the locking ring and cap can be broken if sufficient unscrewing torque is applied to the cap; and the broken connectors and dropped ring provide visual evidence that tampering has at least been attempted.

Conti discloses an overcap for receipt on a jar in surrounding relation to a threaded closure cap of the jar and which when mounted prevents tampering with the closure cap and unauthorized entry into the jar interior. The overcap includes an upper surface overlying the closure cap and a skirt depending circumferentially therefrom. The skirt is radially spaced from the closure cap substantially along its length so that the overcap is free for rotational movement relative to the closure cap and cannot be frictionally coupled to the closure cap to effect removal of the latter.

Magnusson discloses a tear tab closure for containers which comprises a cap having a top, a downwardly depending skirt, a tear tab projecting from the skirt and terminating in a finger ring. The tear tab is relatively short and the finger ring is secured thereto by any suitable mechanical or adhesive fastening means. The finger ring has a large enough inside diameter to facilitate capture of the finger ring by a finger of the user and it may be disposed to lie at the side of the container or it may be large enough in diameter to encircle the container in close proximity thereto. Dubach discloses closure means for a bottle for hermetically sealing the bottle. The disclosed closure means is shaped like a cap comprising at least one slitting by means of which the

side wall of the cap spreads when being set. The cap furthermore comprises an inside annular bead and a sealing collar for hermetically sealing the cap onto the bottle. The cap further comprises a lift-off element for easy reopening and at least one tear-off tensioning member spanning the slitting so as to counteract spreading and acting as a warranty signet.

Smalley discloses a tamper-indicating, press-on, pull-off closure for maintaining pressure in a container whereby the closure and container provide a package which may be readily opened by a customer without the use of tools and without the creation of dangerous sharp edges. This closure includes a cap and a cap liner which fits within the cap and is formed integral with a pull ring for removal of the cap from a container. A plurality of severable tamper-indicating webs are formed between the pull ring and the cap liner and sever upon actuation of the pull ring to indicate tampering with the package.

Walter discloses a tamper-proof cap and neck assembly which are made of stretchable plastic material in which the neck has portions fitted within and about a short metal neck portion of a container which serves as a rigidifying back-up for the plastic neck. A locking shoulder on the neck provides a deflection-resistant structure and thereby prevents a tamper-indicating ring connected to the cap from slipping off the shoulder without tearing upon initial unthreading of the cap. This rigidified structure also facilitates application of the tamper-indicating ring during initial threading of the cap onto the threaded neck at which time the ring is stretched over the shoulder by a cap bead which engages force-transmitting posts integral with the ring for forcing the ring over the locking shoulder.

Grussen discloses a one-piece plastic bottle cap which comprises a crown-shaped main part encircled by a reinforcing ring which holds the main part on the bottle and is integral therewith over a 60° sector, but may be swung upwardly and used to pull the cap off the bottle. The cap has two depending skirts and the inside of the outer skirt is provided with retaining means for engagement over the peripheral ridge on the mouth of a bottle.

Westfall discloses a composite closure which includes a flexible, resilient plastic fitment, and a gasketed rigid closure panel. The fitment has a perforate top and dependent skirt. The closure panel is retained within the skirt. A lifting ring in the top of the flexible plastic fitment is joined to marginal portions of the fitment top by breakable bridging portions and by substantially unbreakable integral hinge portions attached directly to a portion of the skirt. Once breakable bridging portions are broken, the semi-detached ring serves to alert shoppers that the closure has been previously tampered with or removed.

While many of the intended purposes for the listed references are much the same, and in part similar to the intended purpose of the present invention, it is to be noted that the novelty of a device is not based upon its intended purpose, but rather on its uniqueness of structure employed to accomplish the particular purpose. Further, none of the disclosed devices rely on an increased axial height of the closure in order to preclude the ability to manually remove the closure from the container neck by pulling or twisting the closure off, a technique which is available with those closure designs of a limited axial height. As should be understood, when the axial height of a snap-on, flexible closure is somewhat small with respect to the diameter of the closure,

then the side wall of the closure may be deflected outwardly to a sufficient degree in order to clear the top rim of the container neck thereby allowing the closure to be removed. If tamper-evident means are disposed as part of the closure they may not disclose any tampering depending upon their type and location. Due to the fact that such closures are typically fabricated from a flexible synthetic material, if only a minimal amount of side wall flexing is required in order to sufficiently distort the closure so that it may be removed from the container, then it is likely that any frangible elements or other tamper-evident features will not be broken or severed by this minimal amount of flexing. For this reason, the closure of the present invention has an increased axial height, and relative to the diameter size of the closure, a minimal amount of flexing is not sufficient to break or sever the frangible elements and is not sufficient to distort the side wall of the closure sufficiently for removal from the container neck. Any amount of flexing or distortion of the side wall of the closure that would enable its removal from the container neck would by necessity according to the present invention's design result in tearing of the side wall, breaking of the frangible elements connecting the bail handle to the side wall or partial severing of the score lines which are disposed in the side wall of the closure.

The concept of increasing the axial height of a snap-on closure in order to prevent prying off of the closure without detection is a concept that is completely novel. Another novel feature of the present invention includes a primary seal design that enables the normal cap liner to be eliminated.

#### SUMMARY OF THE INVENTION

A flexible, plastic snap-on closure for use in combination with a container neck in order to seal closed the container in a tamper-evident manner according to a typical embodiment of the present invention comprises a flexible cap body having a top surface and a generally cylindrical surrounding side wall, an inwardly protruding annular rib, an annular connection portion disposed between the annular rib and the top surface and arranged to define an inwardly opening annular channel, a bail handle attached to the surrounding side wall by means of two spaced-apart attachment ribs which are integral with the bail handle wherein the side wall has a pair of score lines, each score line disposed adjacent a corresponding attachment rib, and wherein the closure has an increased axial height which is sufficient relative to its diameter size and flexibility to prevent defeat of the closure without some indication resulting on the closure that tampering has occurred.

One object of the present invention is to provide an improved snap-on, tamper-evident container closure.

Related objects and advantages of the present invention will be apparent from the following description.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation view of a snap-on, tamper-evident container closure as received on a container neck according to a typical embodiment of the present invention.

FIG. 2 is a top plan view of the FIG. 1 container closure.

FIG. 3 is a front elevation view in full section of the FIG. 1 container closure as disposed on a container neck.

FIG. 4 is a front elevation view in full section of the FIG. 1 container closure.

FIG. 4A is an enlarged detail of a channel which comprises part of the snap-on capability of the FIG. 1 container closure.

FIG. 5 is a front elevation view in full section of the FIG. 1 container neck.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring to FIGS. 1 and 2, there is illustrated a snap-on, tamper-evident container closure 20 as disposed on a container neck 21. The container closure includes a substantially flat though recessed top surface 23 (see FIG. 3), a generally cylindrical surrounding side wall 24, and a connecting portion 25 which is annular in configuration and extends between top surface 23 and the generally cylindrical side wall 24. Integrally disposed as part of closure 20 is a bail handle 26 which extends circumferentially about side wall 24 at a location which is contiguous to the lower edge of side wall 24. The bail handle 26 does not extend completely around the side wall but rather terminates short of a 360° extension with each end of the bail handle terminating in a corresponding and axially-extending integral attachment rib 27. Providing an interface between the two attachment ribs 27 and the side wall 24 are two score lines 28 which are arranged in a parallel manner, a different one adjacent each attachment rib, and disposed on the outer side of the rib rather than between the two ribs. These score lines represent portions of side wall 24 which have a reduced thickness thereby enabling the score lines to be one of the first portions to fracture or sever as bail handle 26 is pulled upwardly. The reduced thickness is achieved by elimination of material from the inside diameter surface of the side wall, leaving the outside surface uninterrupted. As was previously mentioned, the lower edge 31 of bail handle 26 is generally coincident with lower edge 32 of the side wall 24. In the received condition as is illustrated in FIG. 1, the container neck 21 includes a shoulder 33 which, although slightly angled, is disposed in extremely close proximity to lower edge 32. This shoulder is properly located in the axial direction such that the closure 20 may be pushed downwardly onto container neck 21 with a snapped-on and sealed engagement resulting, while at the same time, lower edge 32 is pushed to a location adjacent shoulder 33. The proximity of shoulder 33 to edge 32 and the outside diameter size of shoulder 33 precludes vertical access by a pointed instrument inbetween the closure and container neck. For molding and handling convenience, shoulder 33 may be replaced by a bead, but so long as its size and location are equivalent to shoulder 33, the tamper-evident aspects of the design remain unaffected.

As is illustrated in FIG. 2, the bail handle 26 is attached at three other locations to the side wall 24. These

points of attachment are provided by frangible elements 36 which are broken as the bail handle 26 is pulled upwardly as part of the closure removal procedure. These frangible elements provide yet one further indicator of any tampering attempts which one may make against the container. If one attempts to tamper with the disclosed container closure and elects to use the bail handle, the first elements to be broken will be these frangible elements 36 and due to their spacing around the circumference of the closure, there is in effect no portion of the bail handle which may be lifted up upon sufficiently to remove the closure without one or more of the frangible elements breaking. As the bail handle continues to be lifted upwardly upon, and after the three frangible elements are broken, the score lines which bound each of the attachment ribs will be severed. When such severing takes place, the approximate lower half of the closure side wall becomes disrupted allowing it to flare outwardly so that the closure may be removed from the container neck. As is illustrated, the two attachment ribs extend in an axial direction upwardly across the side wall 24 of the closure for approximately half of the axial height of the closure. By constructing closure 20 such that its side wall is of an increased axial height, the lower portion of the side wall cannot be deflected outwardly a sufficient degree for the closure to be removed from the container neck without one or more of the tamper-evident features being broken. A further aid provided by the present invention for keeping the closure on the container neck until it is desired to be removed is the fact that the radial width of the shoulder 33 is approximately equal to the thickness of side wall 24. Consequently, the outer surface of side wall 24 is generally in circumferential alignment with the outer surface of the container neck 21 at a location below shoulder 33. This is best illustrated in FIG. 3 wherein outer wall surface 37 of side wall 24 is generally in alignment with outer surface 38 of container neck 21.

When the bail handle is lifted upwardly on and the pair of score lines severed, the effect is to allow the skirt portion of the side wall to flare outwardly which has the effect of reducing the axial height of the closure. In fact, the axial height is approximately cut in half and as a result, the axial height dimension relative to the diameter of the closure becomes acceptable for pulling the container closure off of the container neck. Even if one would attempt to gain access to the contents of the container by inserting a tool or other sharp object between the lower edge 32 and shoulder 33, it is not possible to pry outwardly on the side wall a sufficient distance to allow the closure to be pried off of the container neck without at the same time some damage being done to the side wall at the location where the prying occurred. Such a prying attempt would also cause some lifting of the bail handle which could fracture one or more of the frangible elements. Although the synthetic material used for the closure is flexible, it may still be torn, cut or otherwise marred which would in fact be the result from such a prying attempt. Consequently, even if one does not elect to use the bail handle due to its revealing that a tampering attempt has taken place by the fracturing of the frangible elements 36, evidence will still be left behind as to the tampering attempt simply by the marks and disruptions caused to the side wall 24 of closure 20.

While closure 20 may not appear to be significantly higher than other caps, the difference to be noted is

between caps which are threadedly attached to the container neck and those closures which snap onto the neck. For threaded engagement a greater axial height is needed, depending on the thread pitch simply to provide enough threads. However, with snap-on closures the only axial height ever considered was just enough to provide some means of engagement for the snapping together. Thus the present invention is a clear departure from these traditional designs.

The concept of an increased axial height becomes relevant when it is understood that prying off of the closure is as logical to one who is tampering as is lifting up on a bail handle which would immediately reveal that tampering had occurred. As one lifts upwardly on the outer, lower edge of the closure the distance from the lower edge to the top edge of the container rim represents one leg of a right triangle (the height). The diameter of the closure provides the other leg (the length). The angle of this triangle which is opposite the height side is the amount of upward deflection needed to pry the closure off of the container. Simple experiments with the geometry and dimensional values reveal the importance of an increased axial height as an appropriate tamper-evident means for snap-on plastic closures.

Although one aspect of the present invention is the tamper-evident features and the design of the closure which has an increased axial height to prevent prying of the closure off of the container neck without some evidence of that prying being disclosed, another feature of the present invention is the snap-on design and the interior seal which is created by the closure being snapped onto the container neck.

Referring to FIG. 3 which is a full section view of the assembly of the closure onto the container neck and FIGS. 4 and 5 which are full front elevation section views of the closure and the container neck, respectively, it will be seen that the upper portion of both members are specifically configured with male and female portions so as to create a snap-together assembly which provides an adequate seal for the contents of the container. Referring to FIG. 4, closure 20 includes an inwardly protruding annular rib 41 which has a slightly rounded interior surface. Connecting portion 25 which connects the side wall 24 with top surface 23 as well as top surface 23. Connecting portion 25 is configured in such a manner so as to define a downwardly and inwardly opening channel 42. Due to the recessed nature of top surface 23, one side 43 of connecting portion 25 is disposed as a downwardly and inwardly inclined surface. This particular geometry results in channel 42 having a cross section shape which is part-circular and extends in a circular manner for approximately 90 degrees. There is a substantially flat, vertical portion 42a leading from rib 41 to the start of the circular portion 42b. The channel ends with a substantially flat portion 42c which is disposed at approximately 45 degrees and connects to the underside of top surface 23.

Referring to container neck 21, it is arranged into two generally cylindrical though slightly tapered portions, that portion above shoulder 33 and below bead 34, and that portion above bead 34. The outer surface 38 of the portion below shoulder 33 does not comprise a functional part of the closure and container combination, although it should be understood that the outside diameter size of surface 38 relative to the outside diameter size of wall 46, each at the location of shoulder 33,

determines the radial dimension of shoulder 33. Consequently, in order for the thickness of side wall 24 to be substantially equal to the radial dimension of shoulder 33, it is important that the outside diameter of wall 46 and surface 38 be properly selected. Similar constraints are necessary if a raised bead is used in lieu of shoulder 33.

Wall 46 includes at its uppermost location a top rim portion 47 which defines the container opening. As should be understood, each of the male and female contoured portions existing both with the closure 20 as well as the container neck 21 are annular in appearance and uniform as to shape and dimensions throughout their 360° extent. Wall 46 has a very slight upward and inward taper as does closure 20, such that as closure 20 is pressed downwardly, the lower portion of side wall 24 does not encounter dimensional interference as it approaches shoulder 33. This assures that the closure will be easily started on the container and advanced. The fit becomes progressively tighter and tighter as the upper portions of the container and closure are pushed together. Once the closure is fully advanced onto the container neck, lower edge 32 will be adjacent shoulder 33 while at the same time rib 41 snaps over bead 34 as rim portion 47 pushes snugly up into channel 42. This manner of engagement actually provides two sealing locations, one at the upper portion of the container neck where the inside diameter of the rim portion seals against the inwardly tapering annular surface provided by portion 42c which actually fits into the container opening. The other seal location is at the intersection of bead 34 and rib 41. When the closure is pushed onto the neck of the container, the angled nature of portion 42c tries to push the inside diameter of the neck outwardly while the snap-on interference of rib 41 and bead 34 tends to hold the neck inwardly. These two opposing forces put a preload on the seal location of the neck inside diameter and portion 42c.

This tight engagement between these two members facilitates and furthers the tamper-evident objectives of the present design. If the closure was somewhat loosely received by the container neck, then there would be greater dimensional freedom for the purposes of flexing the closure in an attempt to pry it off of the container neck. However, by having tight engagement between the closure and the container neck, this option is not available to one who would attempt to tamper with the contents of the container. The snug fit and provided sealing also permits the present closure to be free of any liner which is often required to insure the requisite sealing.

As has been mentioned, one of the characteristics of the present invention which is believed to be important to its success is the increased axial height of the closure relative to its diameter. When evaluating the relationship between these dimensional values, the thickness and flexibility of the material used for the closure must also be taken into consideration. However, there is a limit on the types of materials which are suitable and thus in accordance with the teachings of the present invention, the axial height of closure 20 of the exemplary embodiment is at least one-half the outside diameter size of the closure. Of course, the greater the axial height, the greater the degree of security against unauthorized tampering. However, since the score lines must be severed to remove the closure, the greater the axial height the longer the score lines must be in order to allow a much larger portion of the closure to flare



outwardly in order to release the closure from the container neck.

A further point to consider with the dimensional proportions of the closure is the fact that the bail handle 26 is designed to be pulled upwardly on and ultimately pass over the top edge of the closure so that it may be comfortably grasped by the fingers of one hand and lifted upwardly on in order to sever the score lines. Since it is also found to be important to dispose this bail handle at substantially the lowest-most point of the closure, if the axial height of the closure is greatly increased such as two or three times what it presently is relative to the diameter, then the bail handle would need a much larger diameter in order to be able to pass over the uppermost surface of the closure. Consequently, a number of factors have to be assessed in evaluating the dimensional relationships, but it should be understood that all other dimensional properties can be satisfactorily established by the 1:2 ratio between the height and the diameter as previously identified. All of these dimensional relationships are also only applicable to the snap-on type of container closure since threadedly engaged closures have an entirely different set of criteria and there would not under those types of designs be a desire or the option of pulling the closure off of the container neck by means of the bail handle. Rather, the closure would simply be unscrewed once any interlocking features or other tamper-evident features were defeated.

One option to the present invention is to provide a total of four score lines with one each being disposed on each side of each attachment rib. The decision as to the number and location of score lines depends in part on the size of the closure, its material, wall thickness and the desired force level to be exerted to remove the closure.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiment has been shown and described and that all changes and modifications that come within the spirit of the invention are desired to be protected.

What is claimed is:

1. A flexible, plastic, snap-on closure for use in combination with a container in order to seal closed said container in a tamper-evident manner wherein the neck of the container is configured with a top rim portion defining a container opening, an outwardly opening annular channel disposed below said top rim portion, a generally cylindrical side wall and a shoulder providing a substantially horizontal abutment surface outward of said side wall and wherein said snap-on closure comprising:

a flexible closure body having a top surface and a generally cylindrical surrounding side wall;  
an inwardly protruding annular rib;  
an annular connecting portion disposed between said annular rib and said top surface and arranged to define an inwardly opening annular channel;  
a bail handle attached to said surrounding side wall by means of two, spaced-apart attachment ribs integral with said bail handle, said side wall including a pair of score lines, each score line being disposed adjacent a corresponding attachment rib;  
said annular rib being suitably configured to fit within said outwardly opening channel, and said inwardly

opening annular channel being suitably configured to snugly receive said top rim whereby the snap-on receipt of the closure by the container creates a sealed and closed condition of the container by means of said snap-on closure; and

said closure having an axial height which is sufficient relative to its diameter and material flexibility in order to prevent removal of said closure without some indication of said tampering being evident on the closure.

2. The snap-on closure of claim 1 wherein said inwardly opening annular channel has a part-circular cross-sectional shape and terminates with an inwardly tapered surface.

3. The snap-on closure of claim 1 wherein said closure's axial height is equal to at least one-half of the closure's outside diameter.

4. The snap-on closure of claim 1 wherein said bail handle is further attached to said closure by a plurality of frangible elements and the lowermost surface of said bail handle is substantially coincident with the lowermost edge of the closure.

5. A flexible, snap-on closure for use in combination with a container neck in order to seal closed the corresponding container in a tamper-evident manner, wherein said snap-on closure comprises:

a flexible closure body having a top surface and a generally cylindrical surrounding side wall;  
a bail handle attached to said surrounding side wall by means of two, spaced-apart attachment ribs integral with said bail handle, said side wall including a pair of score lines, each score line being disposed adjacent a corresponding attachment rib; and

said closure having an axial height which is sufficient relative to its diameter and material flexibility in order to prevent removal of said closure without some indication of said tampering being evident on the closure.

6. The snap-on closure of claim 5 wherein said closure's axial height is equal to at least one-half of the closure's outside diameter.

7. The snap-on closure of claim 5 wherein said bail handle is further attached to said closure by a plurality of frangible elements and the lowermost surface of said bail handle is substantially coincident with the lowermost edge of the closure.

8. In combination:

a container comprising:  
a container neck portion which includes a top rim defining a container opening;  
an outwardly opening annular channel disposed below said top rim;

a generally cylindrical side wall; and  
a shoulder providing a substantially horizontal abutment surface outward of said side wall; and

a flexible, snap-on closure for use in combination with said container neck which comprises:

a flexible closure body having a top surface and a generally cylindrical surrounding side wall, an inwardly protruding annular rib;

an annular connecting portion disposed between said annular rib and said top surface and arranged to define an inwardly opening annular channel;

a bail handle attached to said surrounding side wall by means of two, spaced-apart attachment ribs integral with said bail handle;

11

said side wall including two opposite score lines, there being one score line disposed on opposite sides of each attachment rib;

said annular rib being suitably configured to fit within said outwardly opening channel, and said inwardly opening annular channel being suitably configured to snugly receive said top rim whereby the snap-on receipt of the closure by the container creates a sealed and closed condition of the container by means of said snap-on closure; and

said closure having an axial height which is sufficient relative to its diameter and material flexibility in order to prevent removal of said closure without some indication of said tampering being evident on the closure.

12

9. The snap-on closure of claim 8 wherein said inwardly opening annular channel has a part-circular cross-sectional shape and an interior tapered wedge configuration.

10. The snap-on closure of claim 8 wherein said closure's axial height is equal to at least one-half of the closure's outside diameter.

11. The snap-on closure of claim 8 wherein the side walls of said container neck and said closure are cooperatively sized for an interference fit thereby creating a secondary seal.

12. The snap-on closure of claim 8 wherein said bail handle is further attached to said closure by a plurality of frangible elements and the lowermost surface of said bail handle is substantially coincident with the lowermost edge of the closure.

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[54] SELF LOCKING CONTAINER CLOSURE

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[\*] Notice: The portion of the term of this patent  
subsequent to May 25, 1999, has been  
disclaimed.

[21] Appl. No.: 314,282

[22] Filed: Oct. 23, 1981

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 182,552, Aug. 29,  
1980, Pat. No. 4,331,248, and a continuation-in-part of  
Ser. No. 256,350, Apr. 21, 1981, abandoned.

[51] Int. Cl.<sup>3</sup> ..... B65D 41/48

[52] U.S. Cl. .... 215/253

[58] Field of Search ..... 215/250, 253, 256

[56] References Cited

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3,462,035 8/1969 Grussen ..... 215/320 X  
4,230,229 10/1980 Crisci ..... 215/253

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Primary Examiner—Donald F. Norton

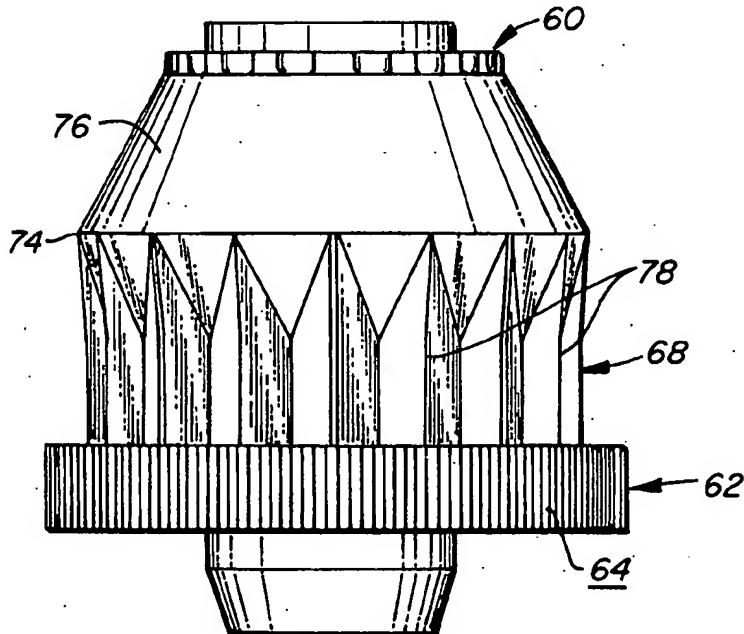
Attorney, Agent, or Firm—Townsend and Townsend

[57]

ABSTRACT

A one-piece container closure for use with pressurized containers, such as champagne bottles. The closure includes a shank attached to a top for sealing the bottle. An expandable skirt depends from the top and surrounds a ring on the bottle neck. A plurality of retaining shoulders extend inwardly from the skirt to engage a lower surface on the neck ring. A retaining ring shaped to conform to the shape of the skirt is frangibly attached to the lower edge of the skirt to inhibit the radial expansion of the lower edge of the skirt to keep the cap on the bottle. To remove the cap, the retaining ring is first separated from the lower edge of the skirt. The retaining ring is then slid up towards the top of the cap or down off of the skirt to allow the skirt to expand radially which permits the retaining shoulders to become disengaged from under the neck ring when the cap is pulled upwardly.

20 Claims, 8 Drawing Figures



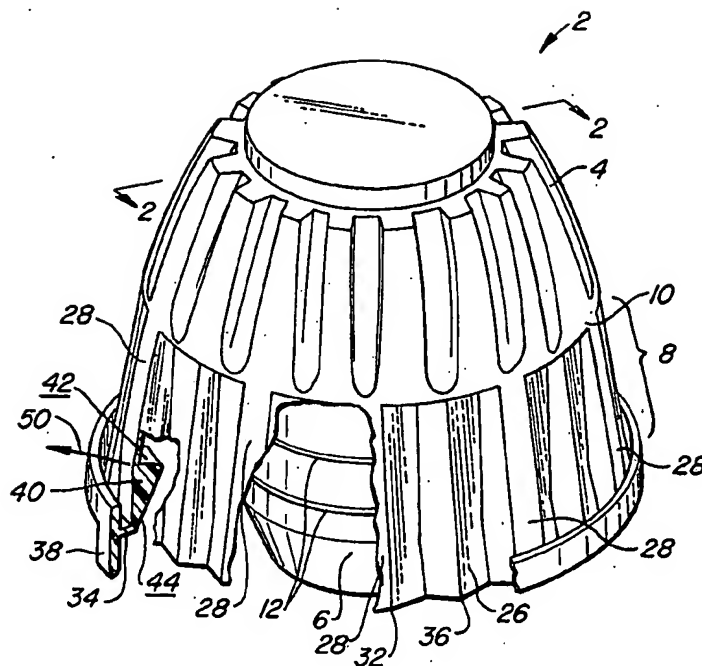


FIG. 1.

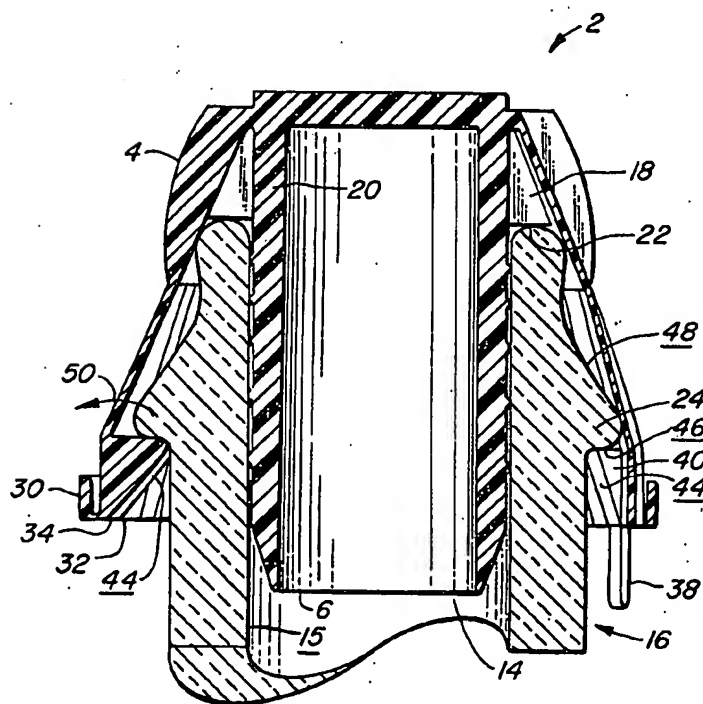


FIG. 2.

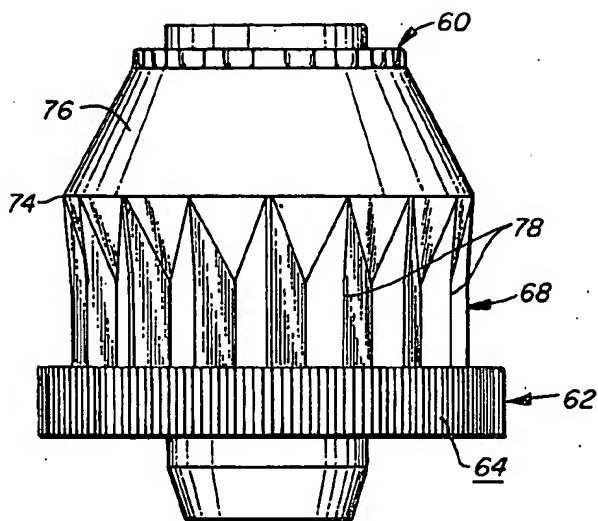


FIG. 3.

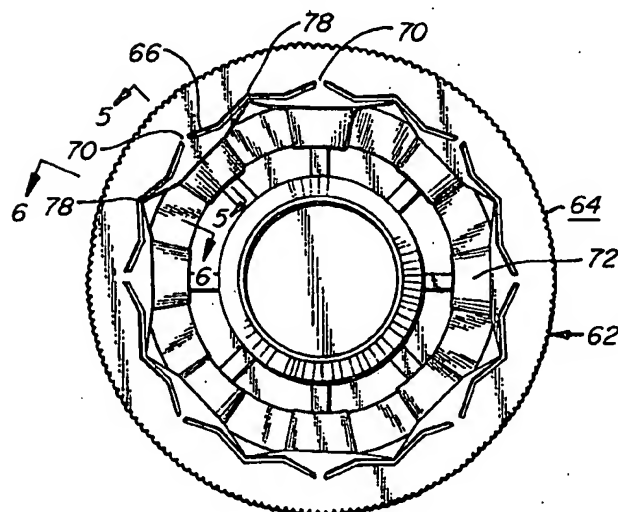


FIG. 4.

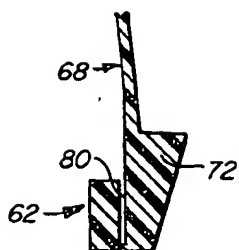


FIG. 5.

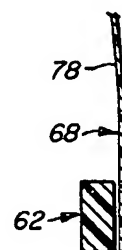


FIG. 6.

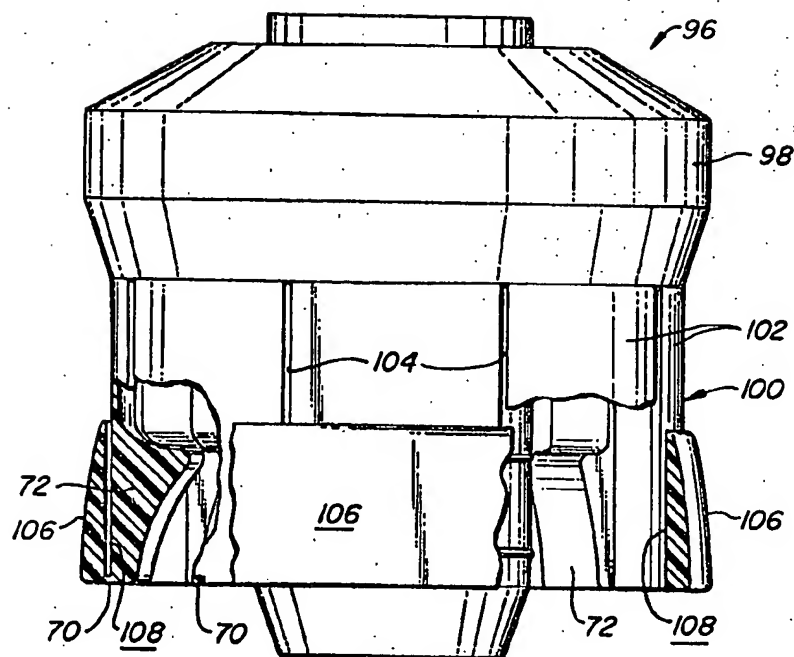


FIG. 7.

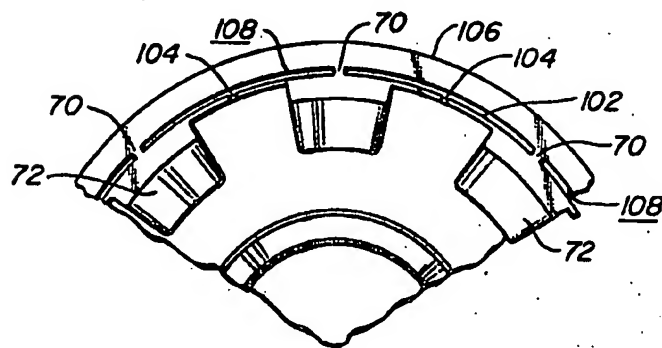


FIG. 8.

## SELF LOCKING CONTAINER CLOSURE

This is a continuation-in-part application of my co-pending U.S. Patent Applications Ser. No. 182,552, filed Aug. 29, 1980, now U.S. Pat. No. 4,331,248 and Ser. No. 256,350 filed Apr. 21, 1981, now abandoned.

## BACKGROUND OF THE INVENTION

Closures for pressurized containers have generally been multicomponent devices. For example, sparkling wines, such as champagne, sekt or spumante have often been sealed with cork closures wired onto the neck of the bottle. These natural cork closures, besides being expensive, require a number of steps for their insertion and additional steps for placing the wire retainer over the cork and around a ring on the neck of the bottle. Such a closure adds to the cost of the product sold.

One problem with closures for sparkling wines which use wire retainers is their well-known propensity to suddenly blow off the end of the bottle after the wire retainer is removed. This may tend to happen especially if the wine is not chilled sufficiently or if it is shaken or jarred; in either case the high pressure developed beneath the cork, be it natural or plastic, is sufficient to discharge the cork from the bottle at quite high velocities. Damage to persons and property often results from the sudden, unexpected discharge of the cork.

In U.S. Pat. No. 3,946,891 to Picoy, et al., a flexible plastic cap for use on pressurized containers which eliminates the wire retainer is disclosed. The cap in Picoy includes an inner shank, an outer cap and a depending skirt portion having internal rib portions for engagement under the ring on the neck of the bottle. However in Picoy the cap relies upon circumferential expansion of the skirt material to permit the rib portion to pass over the outwardly extending ring or band on the bottle. Thus, the thickness of the ring around the neck of the bottle and the thickness of the rib portion on the skirt are limited by the resilient character of the material from which the cap is made. If the circumferential stretching is too great, the skirt may be permanently deformed so that the rib portion does not fully engage the lower surface of the rim of the bottle. If the ring and/or ribs are not thick enough, the cap may blow off the bottle. Further, even if the plastic material from which the cap is made would tend to return to its fully unstressed state, because of the time lag involved the cork may be blown off the end of the bottle before such contraction has been completed.

The following U.S. Pat. Nos. may also be of interest: 4,162,736; 4,057,160; 4,033,472 and 3,809,370.

## SUMMARY OF THE INVENTION

A one-piece container closure finding special utility when used with containers holding pressurized fluids is disclosed. The closure, or cap, includes generally a shank and a top attached to the upper end of the shank. The shank is sized to fit within the neck of the container, typically a bottle adapted for holding sparkling wines, such as champagne. The combination of the top and the shank is of conventional design and acts to seal the interior of the bottle.

A skirt portion depends from the lower outer edge of the top of the cap and surrounds the upper portion of the neck of the bottle. The bottle has a neck ring located below the rim of the bottle. Along the lower edge of the skirt are a plurality of retaining shoulders each having a

generally horizontal upper surface for engaging a lower surface on the ring of the bottle.

The retaining shoulders have an upwardly and inwardly tapered inclined surface so that when the cap is placed over the neck of the bottle, the inclined surfaces ride against the neck ring on the bottle. A removable retainer is attached along the lower edge of the skirt to inhibit the radial expansion of the lower edge of the skirt; the lower portion of the retaining shoulders are likewise inhibited from radial expansion by the retainer.

As the retaining shoulders of the cap are forced over the neck ring, the upper portions of the shoulders pivot radially outwardly. This outward pivotal movement can be provided for in several ways. In one embodiment, the skirt has a number of resilient, expandable pleated sections. In another embodiment the expandable skirt has a smooth cylindrical or slightly conical surface with vertical slits in the skirt between the retaining shoulders to enable the resilient skirt to expand radially when the shoulders are forced over neck ring.

After the upper, ring engaging surfaces of the retaining shoulders have cleared the neck ring, the resilient skirt and retainer pivot the shoulders back to their normal, generally horizontal attitude so that the ring engaging surfaces of the retaining shoulders engage the lower surface of the neck ring.

The removable retainer can be a simple tear strip attached at points along the lower edge of the skirt. However, it has been found that a retainer in the form of a ring having an inner circumference shaped to conform to the outer surface of the skirt is generally preferred over a tear strip type of retainer. The inner surface of the conforming retaining ring helps to keep the pleated sections of a pleated skirt from flattening out against the retaining ring, which can occur at high bottle pressures when using a tear strip retainer. When a skirt having a smooth surface is used, the inner surface of the retaining ring would likewise conform to the shape of the skirt to prevent the lower edges of the skirt sections from expanding outwardly.

To remove a cap having a tear strip type of retainer from a bottle, the tear strip is torn away from the lower edge of the skirt. This allows the entire skirt to expand radially and permit the retaining shoulders to disengage from under the ring on the bottle. However, if the pressure in the bottle is great enough the cap may be blown off the top of the bottle upon removal of the tear strip retaining ring.

To remove a cap having a retaining ring type of retainer, the ring is first pushed up a short distance towards the top of the cap at several places around the retaining ring. This breaks the attachment between the retaining ring and the lower edge of the skirt. However, since the retaining ring still surrounds the lower portion of the skirt, the skirt cannot expand to insure the cap remains on the bottle. The retaining ring is then grasped by the user and slid up towards the top of the cap. When used with a pleated skirt, the sawtooth-shaped conforming inner surface of the ring cannot slide over the top of the cap so that the retaining ring provides a convenient structure for urging the cap off the bottle. The outer circumferential surface of the retaining ring can be grooved to help the user to twist the cap, through the interface of the conforming inner surface of the retaining ring and the pleated skirt, when removing the cap.

Alternatively, after breaking the seal the retaining ring may be slid down away from the skirt and onto the neck of the bottle; the user then can grasp the cap and

pull the cap from the bottle with a twisting movement. The use of the retaining ring therefore allows the cap to be removed in a controlled manner with less effort by the user. Further, one can reseal the bottle by replacing the cap on the bottle and sliding the conforming retaining ring over the skirt to surround the retaining shoulders.

The closure of the invention can be molded as a single, unitary piece; the price of the closure can therefore be low. The corking or capping machines used with the cap can be simple because it is mounted on the container with a single linear movement.

A significant feature of this invention lies in the provision of a resilient, expandable skirt. The pivotal movement of the shoulder as it pivots outwardly when the cap is inserted over the neck of a container is not limited by the elasticity of the material. The pleated, split or otherwise expandable skirt allows the shoulders to pivot as they ride over the ring on the neck of the bottle. Thus the ring on the neck can be thicker and the upper ring engaging surfaces of the retaining shoulders can be much deeper without causing the elastic limit of the skirt material to be exceeded. Because the neck ring-shoulder engaging surface can be much deeper, the cap can be secured to the container with the ability to withstand much higher internal pressures within the container.

The conforming retaining ring, as well as the resilient skirt, provide an extra degree of safety compared with closures using wire retainers. After the retaining ring is separated from its attachment to the skirt, the retaining ring, the resilient skirt and the shoulders continue to keep the cap secured to the container. Only when the cap is grasped by the user, the conforming retaining ring pushed up or down away from the lower edge of the skirt and the cap is urged upwardly, typically accompanied by a twisting action, will the retaining forces of the shoulders be overcome to allow the cap to be removed.

The tear strip type of retaining ring provides a dual function. It secures the lower edge of the skirt against radial expansion to keep the cap on the container. It also insures against tampering with the contents of the container for the only way to remove the cap is to first remove the tear strip. After removal of the tear strip, tampering is obvious.

In addition to the above functions, retaining rings used with pleated skirts keep the pleated sections from flattening out or otherwise deforming when very high bottle pressures are present and provide a convenient structure for applying axial and rotary force to the cap to remove it from the bottle. Retaining rings, whether the skirt is pleated or not, also allow the cap to be used to reseal the bottle and insure that the cap does not inadvertently blow off the top of the bottle when the seal between the retaining ring and skirt is broken.

Additional features and advantages of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of one embodiment of the cap of the invention partially broken away to show a retaining shoulder.

FIG. 2 is a cross-sectional view of the cap of FIG. 1 mounted to the neck of a bottle.

FIG. 3 is a side view of another embodiment of the cap of the invention.

FIG. 4 is a bottom view of the cap of FIG. 3 illustrating the placement and attachment of the conforming retaining ring.

FIGS. 5 and 6 are partial sectional views taken along lines 5-5 and 6-6 of FIG. 4.

FIG. 7 is a side view of a third embodiment of the invention with portions broken away for clarity.

FIG. 8 is a partial bottom view of the cap of FIG. 7.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to FIGS. 1 and 2, a first preferred embodiment of a cap 2 of the invention will be described. Generally cap 2 includes a top 4, a shank 6 extending centrally from the top and a pleated skirt 8 attached to and depending from the lower outer edge 10 of the top.

Although the preferred embodiments will be described in terms of caps particularly adapted for use with a bottle containing sparkling wine, a cap of the present invention can also be used for sealing other types of containers of the type having a ring around the neck of the container.

The top and shank of the cap are of conventional design. The shank includes a number of sealing ridges 12. When the shank is forced within the bore 14 of the neck 16 of the bottle, the sealing ridges are pressed tightly against the interior surface 15 of the bore to insure a tight seal. A number of webs 18, shown in FIG. 2, are formed between the top 4 and the upper portion 20 of the shank. When the cap is fully seated over the neck of the bottle, the webs contact the rim 22 of the bottle.

The neck of the bottle has a ring 24 located on its outer surface below rim 22.

The pleated skirt has a number of alternating, generally vertically disposed, pleated segments 26 and locking segments 28. The locking segments are generally planar members extending from outer edge 10. The pleated segments are arranged between each locking segment and likewise depend from the lower outer edge of the top. A tear strip retainer 30 is connected to the lower edge 32 of locking segments 28 by a relatively thin connecting segment 34. A handle portion 38 of the tear strip ring is provided so that the tear strip ring can be grasped by the user and torn away from the lower edge of the skirt.

A retaining shoulder 40 extends inwardly from near the lower edge of each of the locking segments of the skirt. The retaining shoulders have a triangular cross-sectional shape and include a generally horizontal upper ring engaging surface 42 (see FIG. 1) and an upwardly and inwardly sloping ring biasing surface 44 (see FIG. 2). When the cap is fully inserted over the neck of a bottle, the upper ring engaging surface lies juxtaposed to the generally horizontal lower surface 46 of ring 24 on the neck of the bottle.

The W-shaped cross-sectional outline of pleated segments 26 is shallowest near outer edge 10, is deepest near the ring engaging surface 42 and then narrows somewhat at their lower edges 36. This variation promotes greater flexibility when capping the bottle while somewhat inhibiting radial expansion of the skirt along edges 32, 36 after the tear strip is removed. Therefore, the cap will not be as susceptible to inadvertently blowing off the bottle after the tear strip is removed, a significant safety feature.



To cap the bottle the user simply forces shank 6 of the cap within the bore of the bottle and presses on the top of the cap until surface 42 of retaining shoulders 40 engage lower surface 46 of ring 24. As the shoulders pass over the ring, the tear strip keeps the lower edges of the skirt from radially expanding. The force exerted by the upper surface 48 of ring 24 against ring bias surface 44 of retaining shoulder 40 causes the retaining shoulders to pivot in the direction indicated by arrow 50. This outward pivotal movement is made possible by the expansion of the skirt along the pleated segments.

To remove cap 2 the user first grips the handle portion of the tear strip and tears the tear strip away from the lower edge of the skirt. The user then grasps the top and pulls upwardly, typically with a simultaneous twisting action. The unrestrained pleated skirt allows the shoulders to expand radially and become disengaged from the ring. Depending upon various factors such as the materials chosen for the cap, the size of the ring on the neck of the bottle and the pressures within the bottle, a greater or fewer number of pleated segments and retaining shoulders can be used. Also other types of radially expandable skirts can be used in lieu of the pleated skirt.

Turning now to FIGS. 3-6, a second embodiment of the cap of the invention will be described. The primary difference between cap 60 of FIGS. 3 and 4 and cap 2 of FIGS. 1 and 2 is the use of a conforming retaining ring 62 in lieu of the tear strip retainer 30 used with cap 2. Conforming retaining ring 62 has a grooved or otherwise roughened outer surface 64 and an inner surface 66 generally conforming to the shape of pleated skirt 68. Ring 62 is attached to the lower portion of skirt 68 at alternate points 70. Retaining shoulders 72 extend inwardly from points 70 on skirt 68. Shoulders 72 therefore extend inwardly from alternately pleated segments so that locking segments 28 of cap 2 are not required.

The insertion of cap 60 onto a bottle occurs in substantially the same manner as with cap 2. However, to remove cap 60 the user typically grasps the bottle beneath cap 60 and breaks the seal at points 70 between ring 62 and skirt 68 typically by pushing up on ring 62 with his or her thumb. Conforming retaining ring 62, after the attachment between ring 62 and skirt 68 has been severed, still circumscribes the lower portion 80 of skirt 68. Thus the skirt cannot inadvertently expand outwardly to discharge the cap unexpectedly. Next, the user grasps the cap and urges ring 62 up against a lower outer edge 74 of the top 76 of cap 60. Because of the sawtooth or W-shaped configuration of surface 66, axial movement of ring 62 is stopped by outer edge 74 with a result that axial force exerted on ring 62 tends to force cap 60 off the bottle. If desired, edge 74 can be flared outwardly a small amount, for example 0.05 centimeter, to insure that ring 62 does not slip over top 76 of cap 60. Outer surface 64 is grooved so a rotary twisting force can be transmitted by the user to cap 60 in removing the cap.

With ring 62 adjacent lower outer edge 74 of cap 76, pleated skirt 68 can expand radially allowing shoulder 72 to become disengaged from the neck ring on the bottle. To help the pleated skirt expand freely, edges 78 of skirt 68 are made quite thin so that when the skirt expands the skirt splits along edges 78 for ease of removal of cap 60. If desired edges 78 can be slit so the skirt is in effect made of a number of separate depending locking segments. This may be required when the neck ring on the bottle is large requiring a large amount of

radial expansion by the skirt. The user can reinsert cap 60 back onto the bottle and slide conforming retaining ring 62 around lower portion 80 of pleated skirt 68 to generally surround shoulder 72 to secure cap 60 back onto the bottle.

A third embodiment of the cap 96 of the invention is shown at FIG. 7. In this embodiment the cap is similar to that shown in FIGS. 3-6 except the skirt 100 is generally cylindrical and is made of a number of depending locking segments 102 separated by gaps 104. The conforming retaining ring 106 has a cylindrical inner surface 108 to conform to the shape of skirt 100. The top 98 is slightly enlarged to aid in grasping cap 96 during removal.

The use and operation of cap 96 is similar to that of cap 60 of FIG. 3. After breaking connecting points 70, the user may slip ring 106 down onto the neck of the bottle, grasp top 98 and remove cap 96 with a twisting motion. It has been found that removal of the retaining ring down onto the bottle neck when using either cap 60 or cap 92 may be desired when it would otherwise inhibit the proper radial expansion of the skirt.

The invention can also be used with containers which are not pressurized, although other methods for sealing the bore of the container may be necessary. When used with low-pressure or non-pressurized containers, the shank may be shortened or eliminated. When sealing sparkling wine, a cork insert may be used in addition to, or in lieu of, the shank so that the wine may pick up its subtle nuances during aging. Other modification and variation may be made to the disclosed embodiments without departing from what is regarded as the invention.

What is claimed is:

1. A container closure for use on a container of the type having a hollow neck, a rim at the end of the neck, the rim circumscribing the mouth of the container, and a ring extending around the neck, the closure comprising:

a top portion adapted to seat against said rim to seal said container;

a radially expandable skirt depending from said top portion to surround a portion of said neck, said skirt having an upper edge attached to said top portion and a lower edge opposite said top edge, said lower edge extending past said ring;

said skirt having a plurality of inwardly directed shoulder portions, said shoulder portions having means for rotationally biasing said shoulder portions away from the ring as said shoulder portions pass the ring on the container, said shoulder portions also including a ring engagement surface adapted for engagement under said ring to secure said closure on said container; and

a retaining ring frangibly attached to said skirt below said ring engagement surface to restrict the radial movement of said shoulder portions.

2. The closure of claim 1 wherein said retaining ring has an inner surface shaped to generally conform to an adjacent outer surface of said skirt.

3. The closure of claim 1 wherein said skirt includes a plurality of depending locking segments from which said shoulder portions extend.

4. The closure of claim 3 wherein said locking segments are separated by gaps.

5. The closure of claim 1 wherein said retaining ring is attached to said lower edge of said skirt.

6. The closure of claim 1 wherein said rotational biasing means includes an upwardly and inwardly angled shoulder biasing surface so that as said shoulder portions are urged past the ring on the neck of the container, the shoulder portions being pivoted outwardly under the partial restraint of said expandable skirt and pivoted inwardly after said shoulder portions have cleared the ring.

7. The closure of claim 1 wherein said ring engagement surfaces are generally horizontal.

8. The closure of claim 1 wherein said skirt includes a plurality of radially expandable pleated segments.

9. The closure of claim 1 wherein said skirt is generally cylindrical.

10. An improved bottle closure, particularly suited for sealing pressurized bottles, said bottle having a ring around the upper portion of the neck of the bottle, said closure including a top portion adapted to seat against the rim of the bottle and seal said bottle, a skirt extending from said top portion to surround the upper portion of the neck of the bottle, means for engaging a lower surface of the ring, the improvement comprising:

said skirt is radially expandable so that said ring surface engaging means moves outwardly as said engaging means are forced past the ring on the neck of the bottle during insertion of said closure on said bottle;

a retaining ring frangibly attached to said skirt below said lower ring surface engaging means to allow the complete severance of said ring from said skirt and to limit the radial movement of said lower ring surface engaging means so that said closure is retained on said bottle; and

means for transmitting rotary force from said ring to said skirt after said ring is frangibly detached from said skirt and moved toward the top portion.

11. The bottle closure of claim 10 wherein said expandable skirt includes a plurality of separated clocking segments.

12. The bottle closure of claim 11 wherein said retaining ring has a roughened outer circumferential surface.

13. The bottle closure of claim 10 wherein said rotary force transmitting means further comprises:

said skirt includes a plurality of radially expandable pleated segments; and

said ring has an inner circumferential surface at least a portion of which generally conforms to the contour of said pleated skirt.

14. An article of manufacture comprising:

a hollow container having a hollow neck bounded at its mouth by a rim, said neck having a ring on the external surface thereof and located below the rim; and

closure means for sealing said container mouth and comprising a retaining portion, said retaining portion including:

an expandable skirt depending from said sealing means to surround said ring on said neck and having a plurality of locking segments, each of said locking segments having an inside surface and an outside surface;

a plurality of inwardly projecting shoulder portions extending from the inside surface of said locking

segments and adapted to engage a lower surface of said ring;

a retaining ring completely frangibly attached to said skirt generally below said shoulder portions to restrain radial movement of said shoulder portions and to permit the complete severance of said ring from said skirt, said retaining ring including an inner circumferential surface surrounding a portion of said skirt;

said skirt and said ring being configured to allow said ring to be detached from said skirt and moved along said skirt toward said top portion; and means for preventing movement of said ring past said top portion thereby enabling a user to apply removal force through said ring to said top portion.

15. The article of manufacture of claim 14 wherein said container is a bottle adapted to hold liquid under pressure.

16. The article of manufacture of claim 14 wherein said sealing means includes a shank sized to fit within said hollow neck.

17. A container closure for use on a container of the type having a hollow neck, a rim at the end of the neck, the rim circumscribing the mouth of the container, and a ring extending around the neck, the closure comprising:

a top portion adapted to seat against said rim to seal said container;

a radially expandable skirt depending from said top portion to surround a portion of said neck, said skirt having an upper edge attached to said top portion and a lower edge opposite said top edge, said lower edge extending past said ring;

said skirt having a plurality of inwardly directed shoulder portions, said shoulder portions having means for rotationally biasing said shoulder portions away from the ring as said shoulder portions pass the ring on the container, said shoulder portions also including a ring engagement surface adapted for engagement under said ring to secure said closure on said container;

a retaining ring;

means for completely frangibly attaching said retaining ring to said skirt below said ring engagement surface to restrict the radial movement of said shoulder portions and to allow the complete severance of said ring from said skirt;

said skirt and said ring being configured to allow said ring to be detached from said skirt and moved along said skirt toward said top portion; and means for preventing movement of said ring past said top portion thereby enabling a user to apply removal force through said ring to said top portion.

18. The closure of claim 17 further comprising means for transmitting rotary force from said ring to the balance of said closure after said ring is completely frangibly detached from said skirt.

19. The closure of claim 18 wherein said rotary force transmitting includes portions of said ring and skirt having equal radial dimensions at the same axial position.

20. The closure of claim 17 wherein said movement preventing means includes portions of said ring and top portion having equal radial dimensions at the same rotary position.

[54] SNAP ON BOTTLE CAP

[75] Inventor: Harry Crisci, New Castle, Pa.

[73] Assignee: Northern Engineering & Plastics Corporation, New Castle, Pa.

[21] Appl. No.: 13,269

[22] Filed: Feb. 21, 1979

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 967,390, Dec. 7, 1978.

[51] Int. Cl.<sup>3</sup> ..... B65D 41/48

[52] U.S. Cl. .... 215/253; 215/295; 215/320

[58] Field of Search ..... 215/253, 370, 295, 306, 215/305, 320; 220/375

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Primary Examiner—Allan N. Shoap

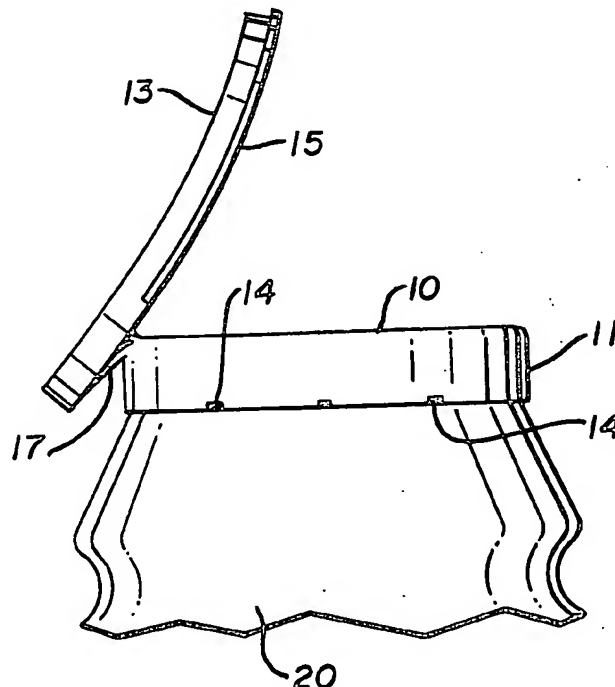
Attorney, Agent, or Firm—Webster B. Harpman

[57]

ABSTRACT

A snap on bottle cap for a container having a neck configuration including an annular shoulder over which the bottle cap is engaged so as to be self-retaining thereon. The bottle cap is formed of resilient material permitting distortion of the cap when it is applied to the bottle. A ring is positioned around and fastened to an annular flange of the cap by a plurality of frangible elements and it is attached to a portion thereof separated from the remainder by spaced cutaway areas. The ring thus may be used as a pull ring to free the portion of the annular flange as necessary in removing the cap by permitting the remainder of the cap to expand circumferentially so as to become disengaged from the annular shoulder on the neck portion of the bottle. The separation of the ring provides a visual indication of tampering.

5 Claims, 5 Drawing Figures



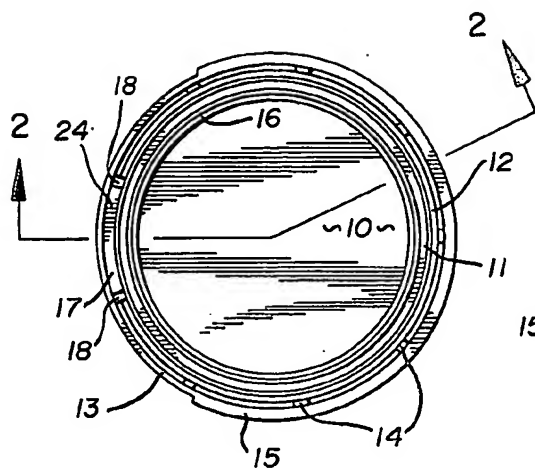


FIG. 1

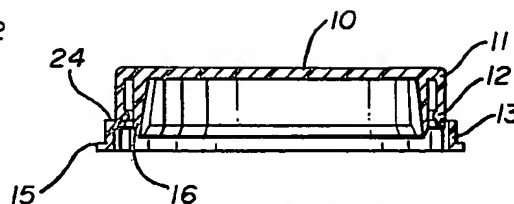


FIG. 2

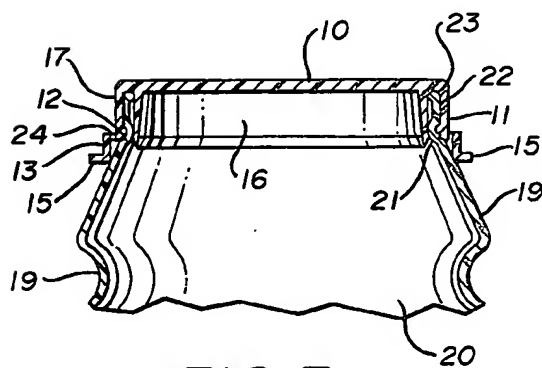


FIG. 3

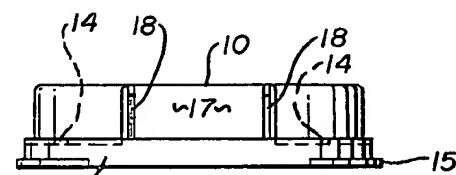


FIG. 4

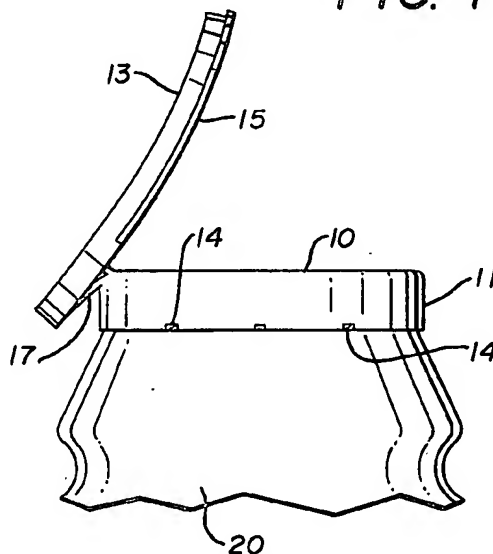


FIG. 5

## SNAP ON BOTTLE CAP

This application is a continuation-in-part of application Ser. No. 967,390, filed Dec. 7, 1978.

## BACKGROUND OF THE INVENTION

## (1) Field of the Invention

This invention relates to bottle caps as used on milk bottles and the like wherein a separable portion of the cap indicates tampering with the cap so that the purchaser may be assured that the contents of the bottle are as originally packed.

## (2) Description of the Prior Art

Snap on bottle caps as heretofore proposed may be seen in U.S. Pat. Nos. 3,411,652; 3,572,413; 3,592,349; 3,872,933 and 4,090,630.

In each of the foregoing disclosures bottle caps are disclosed which theoretically are self-retaining on an appropriately shaped neck of a container such as a bottle. The inherent problem which such devices in the difficulty of removing them if they are formed of a material that is sufficiently rigid to keep the cap in position on the bottle in a liquid tight manner and alternately the leakage of the contents of the bottles if the caps are formed of a flexible material which would facilitate their removal.

Additionally no indication of tampering with or previous removal and replacement of the caps is provided. Attempts have been made to overcome these difficulties and in U.S. Pat. Nos. 3,462,035, reissue 27,648; 3,940,004 and 4,037,746, tear strips or portions facilitating the removal of the cap from the container are provided. The problems with such devices is primarily the difficulty in applying the caps to the containers as the unusual configurations of the tear strips or attachments makes the caps difficult to handle by the automatic equipment which is used in applying the caps to the containers such as milk bottles or the like.

Still further proposals have been made to tear away a portion of an annular flange or skirt on a bottle cap so as to destroy the portions thereof that engages and secures the cap in closed position on the neck of a container. Such devices may be seen in U.S. Pat. Nos. 3,120,900; 3,338,446 and 3,392,862.

The present invention overcomes the several difficulties experienced with the prior art bottle caps by providing a relatively small cap of resilient material in a form that will be self-retaining when snapped into position on a bottle having a neck configuration including an out-turned annular shoulder and which may be relatively easily removed by separating most of an annular reinforcing ring from the cap to form a full ring attached to a portion of the annular flange of the cap which permits the circumference of the cap to be expanded so as to free the same from the shoulder on the bottle and at the same time to provide a tell-tale indication that the cap has been removed and/or replaced.

## SUMMARY OF THE INVENTION

Milk bottles of the one gallon or half gallon size blow molded of resilient flexible plastic material employing flexible plastic bottle caps threadably engaged thereon have become widely used in distributing milk because of the advantages of one time use packaging and the desirability of readily indicating to the final consumer the uncontaminated, unopened bottle. A typical prior

art tamper proof bottle cap may be seen in my U.S. Pat. No. 3,504,818.

The present invention forms the bottle cap of a resilient material in a shape and configuration that may be easily and quickly applied to a milk bottle having a neck configuration with an annular shoulder thereon by simply pushing it downwardly thereon. The bottle cap is distorted in the application to the bottle and becomes self-retaining and provides dual sealing areas to insure a liquid tight closure. A ring having a reinforced lower edge is secured to the annular flange of the cap by a plurality of frangible elements spaced circumferentially thereon. The annular flange has a pair of vertical slots defining the portion of the annular flange that is attached to the ring. The ring can be grasped manually and separated from the remainder of the cap so as to deform and lift the attached portion of the annular flange permitting the same to expand circumferentially and radially so that the cap is conveniently and easily removed. Attempts to remove the cap are thus visually indicated.

## DESCRIPTION OF THE DRAWINGS

FIG. 1 is a bottom elevation of the bottle cap;  
FIG. 2 is a cross section on lines 2—2 of FIG. 1;  
FIG. 3 is a cross section similar to FIG. 2 showing the cap engaged on the neck portion of a bottle;  
FIG. 4 is a side elevation of the bottle cap; and  
FIG. 5 is a side elevation of a portion of the bottle showing the bottle cap partially removed therefrom.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

In its illustrated form the bottle cap as seen in FIGS. 1, 2 and 4 of the drawings comprises a top portion 10 having a depending annular flange 11 on its peripheral edge. An annular rib 12 is formed on the inner surface of the flange 11 adjacent its lowermost edge. A ring 13 is affixed to the outer surface of the annular flange 11 by a plurality of frangible elements 14. An outturned right angular secondary flange 15 is formed on the outer lowermost surface of said annular ring 13 and extends around a substantial portion thereof. A relatively thin cross sectionally tapered downturned annular flange 16 is formed on the top portion 10 and is of a diameter smaller than the diameter of the annular flange 11 and thus spaced with respect thereto and with respect to the inner surface of the annular rib 12. A portion 17 of the annular flange 11 is separated from the remainder by a pair of vertical slots 18 as best seen in FIG. 4 of the drawings. The portion 17 becomes a hinge. The ring 13 forms a manually movable device that may be conveniently grasped and separated from the cap. The secondary flange 15 formed on most of the ring 13 acts as a reinforcing member applying additional rigidity and shape retention to the ring 13 which is transferred to the annular flange 15 to provide the necessary strength and resiliency which makes the bottle cap self retaining on the neck of the bottle by holding said portion 17 of the annular flange 11 in closed position until the ring 13 is removed from the rest of the flange 11.

In FIG. 3 of the drawings, the neck portion 19 of a bottle, generally indicated at 20, most of which is broken away, is illustrated in cross section and it will be observed that the finish of the neck 19 of the bottle 20 has an annular inner rib 21 from which an annular flange which is U-shaped in cross section extends. The annular flange includes a vertical section 22 and an

3

inturned horizontal section 23 with the result that the innermost portion of the inturned section 23 and the inner portion of the rib-like configuration 21 form vertically spaced smooth surfaces of the finish neck configuration against which the secondary flange 16 of the cap of the invention will register to form dual liquid tight seals in addition to the seals obtained between the outer surface of the annular flange 22 of the U-shaped neck finish and the inner surface of the annular flange 11 of the bottle cap.

In FIG. 3 of the drawings, the bottle cap of the invention is shown in position on the neck finish of the bottle 20 with the portion 17 of the annular flange in its normal position, reinforced by the ring 13 while in FIG. 5 of the drawings the portion 17 is shown in the position it assumes when it is separated from the remainder of the annular flange 11 of the cap as by lifting it with the ring 13 so as to permit the major portion of the annular flange 11 and particularly the annular rib 12 therein to become enlarged as necessary in freeing the bottle cap 20 from the bottle neck.

By referring to FIG. 5 of the drawings, it will be seen that most of the ring 13 has been separated from the annular flange 11 by manually breaking the frangible elements 14 forming a pull ring attached to the portion 17 of the annular flange 11 through its connecting area 24 which may also be seen in FIGS. 1, 2, and 3 of the drawings. It will be observed that the thin frangible elements 14 are positioned so as to join the ring 13 to the annular flange 11 at evenly spaced locations.

The bottle cap disclosed herein may be easily applied to bottles by conventional capping machines.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention and having thus described my invention what I claim is:

1. A resilient deformable cap comprising a planar top, an annular flange depending from the peripheral edge of the top and having a lower peripheral edge, an annular rib on the inner surface of said annular flange, a reinforcing ring positioned in closely spaced relation to and around the outer surface of said annular flange, said ring

4

having a bottom peripheral edge located beneath said annular flange lower peripheral edge, a vertical hinge portion in said annular flange, said hinge portion being defined by a pair of circumferentially spaced vertical slots defined in said annular flange and extending from said top peripheral edge to said annular flange lower peripheral edge so that said hinge portion is flexible radially outwardly of said annular flange, a portion of said reinforcing ring being integrally attached to said annular flange at said hinge portion and a plurality of circumferentially spaced frangible elements closely connecting the remainder of said reinforcing ring with the remainder of said annular flange, said hinge portion of said annular flange being normally held in position to be in circumferential alignment with the remainder of said annular flange by said reinforcing ring, said hinge portion of said annular flange being deformable by movement of said reinforcing ring so that moving said reinforcing ring to break said frangible elements deforms said hinge portion outwardly and upwardly of said annular flange so that said deformed hinge portion in combination with said reinforcing ring forms a fulcrum of a pull tab upon which pulling force is exerted via said reinforcing ring, said hinge portion and said planar top remaining intact the remainder of said annular flange being permitted to expand radially outward under the influence of said pulling force being exerted thereon via said pull tab.

2. The cap set forth in claim 1 and wherein said portion of said reinforcing ring is attached to the edge of said annular flange.

3. The cap set forth in claim 1 and wherein said annular flange is cross-sectionally tapered with its area of greatest thickness adjoining said top.

4. The cap set forth in claim 1 and wherein said spaced vertical slots in said annular flange are spaced with respect to one another a distance substantially one-eighth of the circumference of said annular flange.

5. The cap set forth in claim 1 and wherein an out-turned right angular flange is formed on the reinforcing ring in an area thereof spaced with respect to said attached portion.

\* \* \* \* \*

[54] **EASY-OPEN, TAMPER-INDICATING CLOSURE**

[75] Inventor: Ned J. Smalley, Perrysburg, Ohio

[73] Assignee: Owens-Illinois, Inc., Toledo, Ohio

[22] Filed: Mar. 21, 1975

[21] Appl. No.: 560,708

[52] U.S. Cl. .... 215/253; 215/305

[51] Int. Cl.<sup>2</sup> .... B65D 41/32

[58] Field of Search ..... 215/253, 254, 256, 305

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| 3,865,268 | 2/1975 | Coop.....     | 215/253 |
| 3,866,782 | 2/1975 | Westfall..... | 215/253 |

Primary Examiner—Ro E. Hart

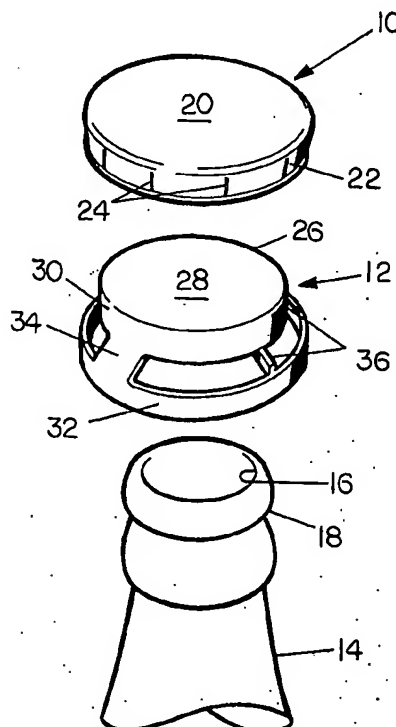
Attorney, Agent, or Firm—A. J. Steger; E. J. Holler

[57]

**ABSTRACT**

This disclosure relates to a tamper-indicating press-on, pull-off closure for maintaining pressure in a container whereby the closure and container provide a package which may be readily opened by a consumer without the use of tools and without the creation of dangerous sharp edges. This closure includes a cap and a unique cap liner which fits within the cap and is formed integral with a pull ring for removal of the cap from a container. A plurality of severable tamper-indicating webs are formed between the pull ring and the cap liner and sever upon actuation of the ring pull to indicate tampering with the package. The cap incorporates a plurality of scores in its skirt portion which fracture when the pull ring is actuated to thereby release the cap from engagement with the container.

1 Claim, 3 Drawing Figures



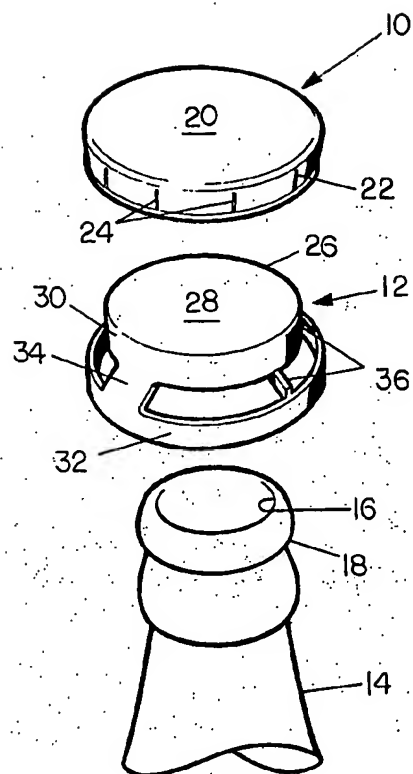


FIG. 1

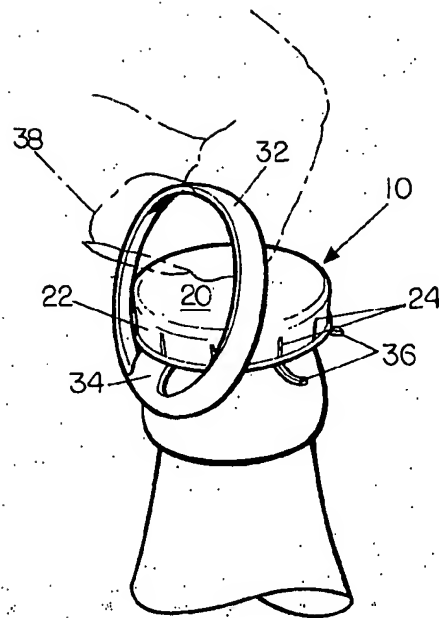


FIG. 2

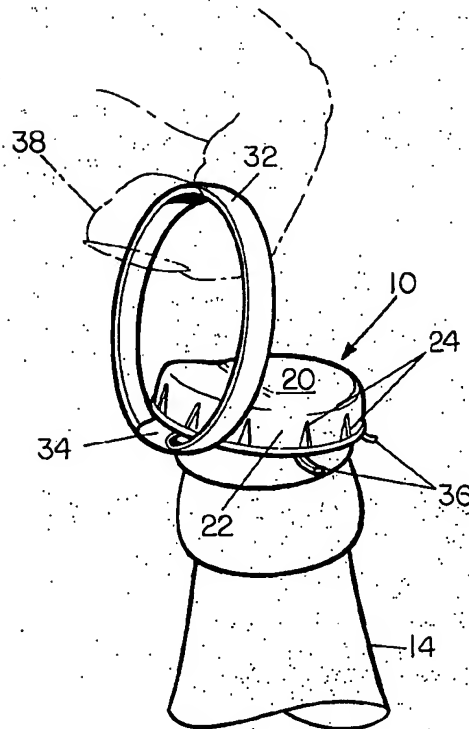


FIG. 3



## EASY-OPEN, TAMPER-INDICATING CLOSURE

## BACKGROUND OF THE INVENTION

This invention relates to container closures and, more specifically, it relates to a tamper-indicating press-on, pull-off closure for maintaining pressure in a container whereby the closure and container provide a package which may be readily opened by a consumer without the use of tools.

Several types of tamper-indicating closures are presently used for sealing a container and maintaining pressure in the container. These types of closures are particularly needed in conjunction with packaging beverages. One such type of tamper-indicating closure is a metal twist-off cap which incorporates a severable metal ring which fractures upon twisting of the closure so as to remain on the container neck as a tamper-indicating band when the closure has been removed. This type of closure results in a sharp edge remaining on the closure portion which has been removed and on the tamper-indicating band which remains on the container. These sharp edges are inherently dangerous to the consumer utilizing the package. In addition, a twist-off closure requires more expensive and complicated application machinery than does a simple push-on closure.

Another type of tamper-indicating closure is the pull tab which involves severing a portion of the closure in the form of a pull tab, thereby releasing the pressure from within the container. The closure may then be pulled from engagement with the container by means of the pull tab. This type of closure also is inherently dangerous, as a sharp edge is formed both on the pull tab and on the opening formed in the closure. Thus, there has been a long felt need in the packaging art for a press-on, pull-off closure which incorporates a tamper-indicating feature and eliminates any sharp edges remaining after removal of the closure.

## SUMMARY OF THE INVENTION

It is, therefore, an object of this invention to provide a tamper-indicating press-on, pull-off closure for maintaining pressure in a container whereby the closure and container provide a package which may be readily opened by a consumer without the use of tools and without the creation of dangerous sharp edges.

The closure of this invention includes a cap and a unique cap liner which fits within the cap and is formed integral with a pull ring for removal of the cap from the container. The pull ring is connected to the cap liner by means of a hinge and also by a plurality of severable tamper-indicating webs which sever upon actuation of the ring pull to indicate tampering with the package. The cap incorporates a plurality of scores in its skirt portion which fracture when the pull ring is actuated to thereby release the cap from engagement with the container. It is suggested that the cap be formed from metal and the cap liner and pull ring be formed from flexible plastic.

Other objects, features and advantages of the subject invention will become apparent to one skilled in the art upon reference to the following detailed description of the invention and the drawings illustrating a preferred embodiment thereof.

## DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a cap, cap liner and ring pull member, and container neck formed in accordance with the teachings of the present invention;

FIG. 2 is a perspective view of the closure of this invention in sealing engagement with a container neck finish with the ring pull member illustrated in the initial stages of the removal procedure; and

FIG. 3 is a perspective view of the closure of this invention as it is being removed from engagement with a container neck finish.

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A closure which embodies the teachings of this invention is formed from two separate members, a cap member 10 and an integral cap liner and ring pull member 12. The closure of this invention is adapted to be pressed into sealing engagement with a neck portion 14 of a container which terminates at its upper end in an open mouth 16 and incorporates a sealing bead 18 adjacent to the open mouth 16.

The cap member 10 incorporates a top wall 20 which is sized to span and completely cover the open mouth 16 on the container neck 14. A skirt portion 22 is formed integral with the top wall 20 and depends downwardly therefrom around the entire circumference of the top wall 20. The skirt portion 22 is adapted to surround and engage the sealing bead 18 on the container neck 14 when the closure is pressed thereon. A plurality of fracturing scores 24 are formed in the skirt portion 22 of cap 10 and are adapted to fracture upon the application of sufficient force to enable the removal of the cap member 10 from sealing engagement with the container neck 14.

The integral cap liner and ring pull member 12 includes a generally cup-shaped liner portion 26 which features a top wall 28 and a depending skirt 30 which are adapted to fit snugly within the cap member 10 and fit flushly against the interior surfaces of the top wall 20 and skirt 22, respectively, of the cap member 10. The liner portion 26 serves as a seal between the cap member 10 and the container neck 14 when the cap member 10 is pressed into engagement with the sealing bead 18 on the container neck 14. A ring pull portion 32 is formed integrally with the cap liner portion 26 and securely attached thereto by means of a hinge member 34. The ring pull 32 is also connected to the cap liner portion 26 by means of a plurality of severable tamper-indicating webs 36. Thus, when cap liner portion 26 is pushed within the cap member 10 and the combination pressed into sealing engagement with the sealing bead 18 on the container neck 14, the closure and container combination form a package which will maintain pressure within the container.

It should be noted that while the closure of this invention is designed specifically to be opened by a consumer without the use of tools, it may be readily opened by means of any suitable beverage cap removal tool. Such a tool could be utilized by having a portion of the tool rest against the top wall 20 of the closure of the cap member 10 while another portion is pushed under the lower edge of the skirt portion 22 to thereby lift the skirt portion to vent the container and lift the closure out of engagement with the container.

However, the unique closure of this invention incorporates its own pull-off removal means and a tamper-

3

indicating feature to indicate to the consumer possible previous tampering with the package. As can be seen in FIG. 2, the ring pull portion 32 may be bent upwardly with respect to the cap member 10 by pivoting it about the hinge member 34. When the ring pull portion 32 is pulled upwardly, the tamper-indicating webs 36 are severed, thereby serving as a visual indicator to the consumer that the package may have previously been opened. Once the ring pull 32 has been pivoted to the position shown in FIG. 2, the consumer may insert his finger, indicated schematically as numeral 38, through the hole in the ring pull 32. When an upward force is asserted on the ring pull 32, the scores 24 in the skirt portion 22 of cap member 10 begin to fracture as shown in FIG. 3. Once the cap member 10 has been pulled out of sealing engagement with the container neck 14, the container becomes vented, thereby releasing the pressure therein. The cap member 10 may be removed from the container neck by continued upward movement of the ring pull. Thus, it can be seen from the preceding description that the closure of this invention incorporates its own unique removal method which facilitates easy removal of the closure and also incorporates a tamper-indicating feature. Once removed, the resulting ring pull and closure of this invention has no sharp edges exposed which could result in injury to the consumer.

It should be noted that the closure of this invention may be applied by any of the standard press-on closure application machinery available and does not require the use of more expensive and complicated twist-on applying machinery. However, to ensure a maximum crimp of the cap on the glass finish needed to hold the pressure in some of the highly carbonated soft drinks (storage in high temperature) a specially designed capping head is available which applies the cap as a

4

straight throat capping head and then crimps or forces the wire at the cap skirt further under the glass finish bead.

I claim:

1. A tamper-indicating press-on, pull-off closure for maintaining pressure in a container, said container including a neck portion with a sealing bead thereon and an open mouth at the upper extremity thereof, said closure comprising:

a plastic inner cap having a top wall spanning the open mouth of said container and a depending circumferential skirt surrounding and engaging the neck portion of said container;

a ring pull member formed integral with said inner cap, said ring pull being connected to and depending downwardly from the lower free edge of the circumferential skirt of said inner cap by means of a hinge and at least one severable, tamper-indicating web which severs upon actuation of said ring pull member to remove said inner cap from engagement with said container neck;

an outer metal cap adapted to snugly fit over said inner cap and having a top wall overlying the top wall of said inner cap and spanning the open mouth of said container and a depending circumferential skirt surrounding the depending circumferential skirt of said inner cap and being crimped into holding engagement with the sealing band on said container neck to thereby retain said inner and outer caps in sealing engagement with said container neck to maintain pressure within said container, and said outer cap including at least one score in its skirt which fractures upon actuation of the ring pull member to thereby release the outer cap from engagement with the container neck.

\* \* \* \* \*

May 29, 1973

J. GRUSSEN

Re. 27,648

PLASTIC BOTTLE CAP WITH INTEGRAL HANDLE

Original Filed July 25, 1968

3 Sheets-Sheet 1

FIG. 1

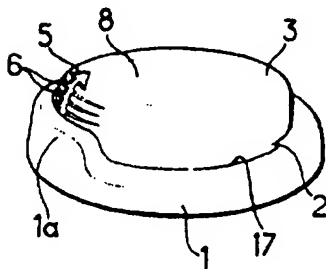


FIG. 2

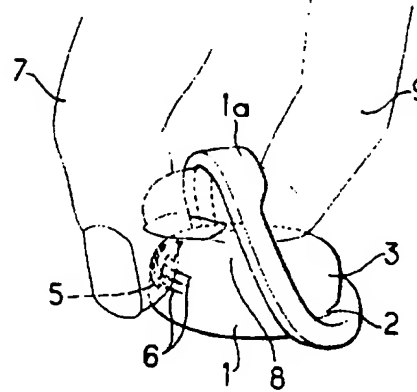


FIG. 3

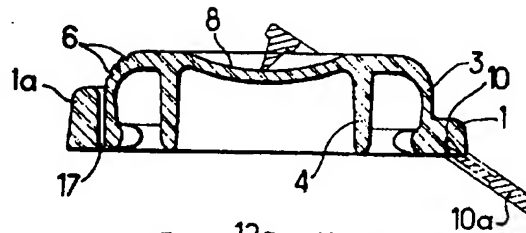
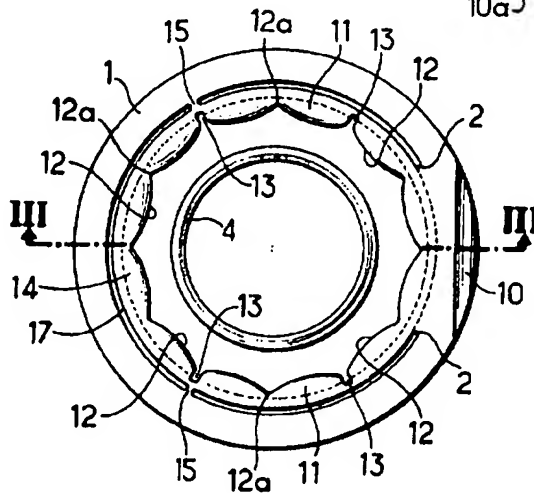


FIG. 4



May 29, 1973

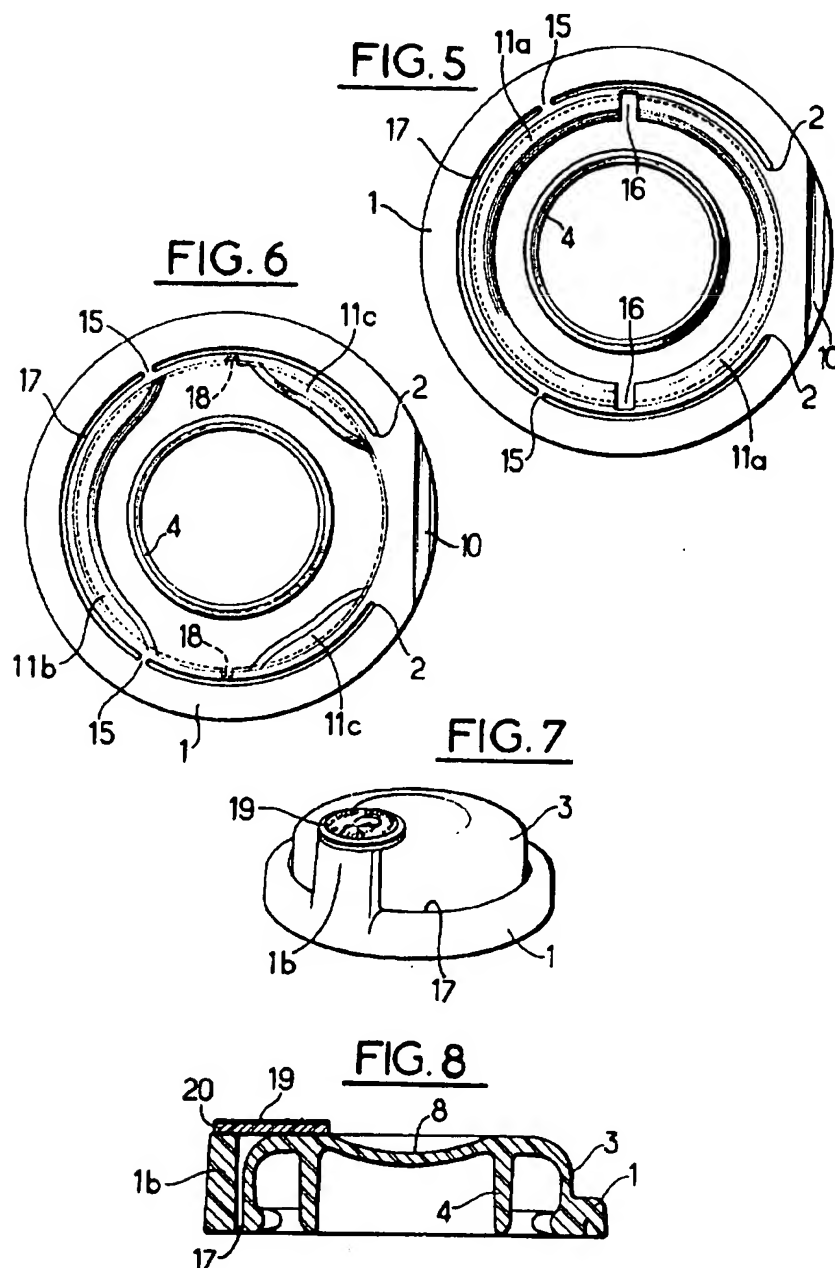
J. GRUSSEN

Re. 27,648

PLASTIC BOTTLE CAP WITH INTEGRAL HANDLE

Original Filed July 25, 1968

3 Sheets-Sheet 8



May 29, 1973

J. GRUSSEN

Re. 27,648

PLASTIC BOTTLE CAP WITH INTEGRAL HANDLE

Original Filed July 25, 1968

3 Sheets-Sheet 3

FIG.9

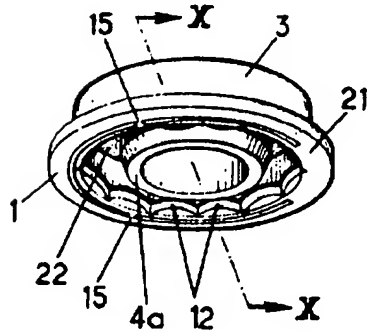


FIG.10

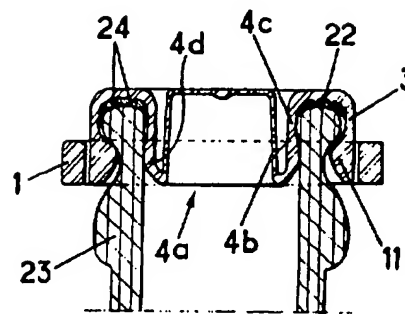


FIG.11

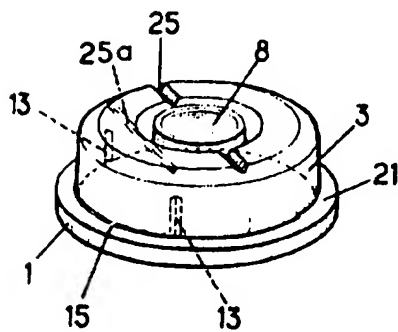
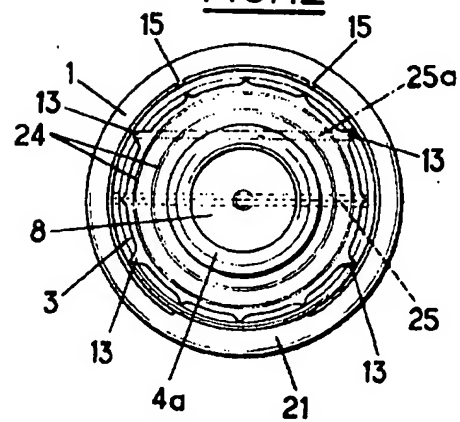


FIG.12



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27,648  
**PLASTIC BOTTLE CAP WITH INTEGRAL HANDLE**  
Jean Grussen, 6 Rue Adolphe Yvon, Paris, France  
Original No. 3,462,035, dated Aug. 19, 1969, Ser. No. 747,635, July 25, 1968. Application for reissue June 3, 1971, Ser. No. 149,867  
Int. Cl. B65d 41/22

U.S. Cl. 215-41

25 Claims

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

## ABSTRACT OF THE DISCLOSURE

A one-piece plastic bottle cap comprising a crown-shaped main part encircled by a reinforcing ring which holds the main part on the bottle and is integral therewith over a 60° sector, but may be swung upwardly and used to pull the cap off the bottle. The cap has two depending skirts and the inside of the outer skirt is provided with retaining means for engagement over the peripheral ridge on the mouth of a bottle.

The difficulties encountered when trying to effect a close seal between plastic caps and glass bottles containing carbonated liquids or compressible bottles under substantial internal pressure from air located above the liquid stored therein are well known.

In effect, the internal ribs designed to hold the cap on are not always adequate to resist the pressure of the gas in the bottle, so that the cap may be spontaneously blown off.

This problem has heretofore been solved by combining plastic caps provided with an internal sealing skirt with external metallic caps such as those known as "crown caps," for example.

The present invention relates to a new type of one-piece cap made of plastic material which does not require the use of a bottle-opener, but is nevertheless capable of resisting high internal pressures in the bottle, said capsule being characterized by the fact that it comprises internal gripping means which are either continuous or separated by relatively thin parts which are extended as weakened points cut into the cap itself. It takes up the same amount of space as a metallic cap of the "crown" type before being applied to the bottle, and may easily be adapted for use in bottle-capping machines of known types by means of slight modifications of the capping heads. The cap comprises an external pull-ring which acts as a reinforcement, said ring being permanently attached to the lower part of the cap so that it cannot be lost by being fastened at one side over an angle of about 60° and, on the opposite side by at least one thin frangible web. The cap is provided at its top with indicating means telling the user where he should exert pressure to tear the frangible webs, so that he may then utilize the ring to pull off the cap by introducing an index finger into a central hole in the ring, while also exerting pressure on a central depression in the top of the cap which serves to prevent swelling of the cap during pasteurization. Introduction of the index finger also permits the thumb to be pressed against a grooved area near said indicia, so as to exert traction on the part of the cap fixed to said ring and thereby flex the cap perpendicularly to its plane of symmetry, and free a part of the retaining ring while tearing said cap and possibly its retaining ring along the line along which it is bent,

2

so as to provide an indication that the bottle has been opened.

Instead of providing indicating means near the preferably grooved area on which the thumb rests, a projection attached to said pulling ring can be provided. This projects radially from the periphery of the ring on the side opposite that at which it is secured to the cap.

Such a projection facilitates the tearing of the web or webs which connect the ring to the cap proper.

It will be readily understood that it is also possible to provide retaining means in the form of two or three members so positioned that the bending takes place at a point at which the retaining means is interrupted.

In either case it is possible to re-use the new cap after it has been removed, but this cap will always display cracks showing that the bottle has previously been opened.

It should be noted that the idea of reinforcing a cap with a ring is extremely old, as is the idea of a pulling ring which may be detached, along a substantial angular sector, from the principal part of the cap.

However, these two devices have never been combined to make it possible to perform all the functions of the cap according to the present application, since the one-piece devices of the prior art have in general comprised a ring connected to a cap by tongues or webs and which is slid into its final position on the cap proper.

Other prior art devices have comprised a pull ring of the type described attached to a simple cap collar which rests on the upper part of the neck of a bottle, but in no case have they comprised a pull ring fixed to the lower part of a cap which indicates that it has been opened, and capable, when in its initial position, of reinforcing the effect of the principal means for holding the cap on the bottle.

In an improved embodiment of the new cap especially adapted for flasks or bottles containing carbonated liquids, improved sealing results from the use of a double-walled skirt of a known type, but characterized by the fact that the innermost wall of the sealing skirt is thinner than the one which is to abut the inside of the neck of the flask or bottle. The thicker wall is preferably provided with a rib which serves as a sealing ring.

Moreover, in order to improve the sealing ability of the cap, it may carry near the upper part of its inner surface, so positioned as to seal against the upper part of a bottle neck between the sealing skirt and the peripheral part of the cap, a sealing ring of compressible material of the plastisol type, preferably made of polyvinyl chloride or copoly polyethylene copolymers and characterized by the fact that this material contains a quantity of plasticizer sufficient to bring its melting point below that of the material used to make the one-piece cap itself, so as to permit said sealing ring to be cast inside the cap or molded therein after the cap itself has first been molded.

These two materials are caused to adhere to each other in a conventional manner, by providing grooves, striations, an undulating surface or a roughened surface in the mating portion of the cap.

The new cap may also comprise a groove at its top which, during removal of the cap, facilitates deformation of the cap and tearing along the weakened lines about its periphery.

This groove is perpendicular to the plane of symmetry of the cap and may be positioned either in a diametral plane or at the level of two weakened lines provided on opposite sides of the part of the cap which is fixed to the cap which is fixed to the cap-opening ring.

3

The characteristics of the present invention will be better understood from a reading of the following description of several embodiments of one-piece plastic caps according to the invention, which embodiments are described purely by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view, taken from above a cap according to the invention before it has been removed from a bottle;

FIG. 2 shows the same cap in the course of being removed from a bottle by means of the pull ring;

FIG. 3 is a vertical diametral section taken along the line III—III of FIG. 4, showing schematically the way in which it cooperates with a bottle opener, by means of a groove provided for that purpose;

FIG. 4 is a plan view taken from the bottom of the same cap;

FIG. 5 is a bottom plan view of another embodiment of the cap according to the invention, comprising a discontinuous retaining ring consisting of two symmetrical semi-circular components;

FIG. 6 is a bottom plan view of a third embodiment of the invention comprising a discontinuous retaining ring composed of three components separated from each other by substantial intervals;

FIG. 7 is a perspective view taken from above another embodiment of the cap according to the invention adapted to receive a tax stamp;

FIG. 8 is a vertical diametral section through the cap shown in FIG. 7, taken along the line passing through the center of said tax stamp;

FIG. 9 is a perspective view taken from below a cap comprising a sealing skirt having two walls which differ in thickness;

FIG. 10 is an axial section showing the cap of FIG. 9 mounted on the neck of a bottle;

FIG. 11 is a perspective view taken from above the cap of FIG. 9, showing two embodiments of said cap; and

FIG. 12 is a bottom plan view showing this same cap without its plastisol sealing ring.

As shown in FIG. 1, the cap comprises a pulling ring 1 attached along part of its periphery, between two notches, one of which is shown at 2 on FIG. 1, to a one-piece bottle cap 3 comprising an inner sealing skirt 4, best seen on FIG. 3.

The cap 3 comprises a mark 5, diametrically opposite the point at which the ring 1 is secured to the cap proper, which designates the point at which the ring should be pushed upward to free it from the cap. This area is also grooved to roughen the surface engaged by the thumb 7 of the user in the manner shown in FIG. 2.

As hereinbefore pointed out, the mark 5 may be eliminated when the pull-ring 1 is provided with a radially projecting boss which serves to indicate the point at which pressure should be applied to separate the ring from the cap.

FIGS. 1 and 4 show that the cap 3 is provided at its center with a depression 8 on which the index finger 9 of the user rests when introduced into the pull-ring 1, and which prevents swelling of the capsule during pasteurization.

FIG. 2 shows that the cooperative action of the digits 7 and 9 and the pull-ring 1 permit removal of the cap by pulling the ring 1, and the part of the cap 3 secured to that ring, in the direction of the thumb 7.

It will be hereinafter seen that, during this operation, the cap is subjected to stresses which cause flexing about a short radius of curvature equivalent to bending, at certain weakened points on the cap.

FIGS. 3 and 4 show that the lower part of the ring 1 is provided with a groove 10 to facilitate removal of the cap by using a conventional bottle-opener.

The details of the internal retaining ring 11 are shown on FIG. 4.

4

This ring has a scalloped inner edge delimiting alternating portions 12 having a maximum radial thickness, and 12a having a minimum radial thickness.

Moreover, the external wall of the cap is weakened at four points 13 at which the retaining ring is interrupted, so as to permit the cap, when pressed by the index finger 9, before complete separation of the retaining ring, especially when pressed on the side 14 opposite the part of the cap secured to the pull-ring 1, to flex along three generatrices perpendicular to the plane of symmetry III—III.

It should also be noted that the retaining ring 11 is joined to the cap 3 by two small, easily torn webs, shown at 15 on FIG. 4, which are, in the embodiment described, aligned with the two weakened points 13, but may also be spaced from these points.

The fact that the bottle has been opened is indicated by the rupture of the webs 15, but when the pull-ring 1 is put back in place to reclose a bottle which has been opened, the tear in the webs is not highly visible. However, removal of the cap also results in visible tears along the vertical external wall of the cap in alignment with the weakened points 13. These tears are not shown in the drawing.

In the embodiments shown in FIGS. 5 and 6, the pull-ring 1 is secured to the cap 3 in the same way as in FIG. 4, but the retaining ring, in the embodiment of FIG. 5, comprises two symmetrically positioned arcuate segments 11a separated by slots 16 which extend into the external wall of the cap 3, but do not reach the slit 17 separating the pull-ring 1 from the cap 3.

When the cap is removed, its external wall is torn adjacent the two slots 16 and these tears remain visible after the cap has been used to recap a bottle and the ring 1 has been put back in place.

In the embodiment shown in FIG. 6, the retaining ring consists of a member 11b, which occupies about 120° sector, and two symmetrically positioned members, each of which occupies a sector of about 60°.

It is easy to understand that regardless of how the cap is removed, whether by means of the pull-ring 1 or by means of a bottle opener such as the bottle opener 10a of FIG. 3, it is advantageous that there be no retaining ring along the part of the capsule on which force is exerted, so that the elements 11c may be easily flexed to facilitate removal of the cap from the neck of the bottle.

In like manner, in alignment with the weakened points in the external wall of the cap, shown at 18 in FIG. 6, flexing takes place along a line perpendicular to the plane of symmetry of the cap and aligned with the spaces between the retaining members 11b and 11c.

This flexing produces tears in alignment with the weakened points 18. These tears remain visible after the pull-ring 1 has been put back in place.

Of course, the embodiment of FIG. 5, which comprises a retaining ring having a substantial radial thickness, which is interrupted only at two points over very small angular sectors, is especially designed for bottles in which there is a high gas pressure, the other embodiments being adequate in most other cases.

In order to make it easier to insert the index finger 9 in the ring 1, FIGS. 1 and 3 show that the ring is thicker at 1a on the side opposite the part secured to the cap 3.

In the embodiment of FIGS. 7 and 8 the pull-ring 1 is also provided with a boss 1b, shaped differently from the boss 1a, positioned on the side of the ring opposite the part thereof which is secured to the cap 3, so that the cap may be used as a tax stamp replacing the stamp required in the case of alcoholic beverages.

In this case, a piece of cardboard, or preferably a wafer of plastic material to which a printed aluminum film has been applied, is adhesively secured or heat welded to the top of the cap 3 and the boss 1b.

Preferably the plastic material is the same as that of which the cap is made.

5

Tearing of the piece of cardboard stuck over the boss 1b and the cap 3, or the tax wafer, when the webs 13 are torn, serves as an additional indication that the bottle has been opened.

When a plastic wafer is used, this material is usually heat welded onto the boss 1b and the cap 3, but it could, of course, be adhesively secured.

A wafer of this type is shown on FIGS. 7 and 8; the printed aluminum is identified by reference numeral 19 and the lower layer of plastic material by reference numeral 20.

FIGS. 9 and 10 show the retaining ring 11, which is variable in thickness, and the lower part of a sealing skirt 4a shown in greater detail on FIG. 10.

The pull-ring 1 is secured to the cap proper at the part 21 which extends over an angular sector of about 60°, and is also secured at its opposite side to the lower part of said cap by means of two frangible webs 15.

FIG. 9 also shows the plastisol sealing ring 22 which covers the part of the cap 3 between the sealing skirt 4a and the peripheral skirt.

This sealing skirt comprises a thin inner wall 4b (FIG. 10) and a thicker outer wall 4c provided with an annular rib 4d which seals against the inside of the neck of the bottle.

The plastisol sealing ring 22 is caused to adhere to the material of the cap by providing two ribs 24 on the inside of the cap, as shown in FIG. 12.

This latter figure also shows the two webs 15 connecting the ring 1 to the periphery of the cap 3, as well as four scorings 13, two of which are shown in broken lines on FIG. 11, and along which the cap is torn during its removal, which is effected by pressing on the central part 8 of the cap while pulling on it by means of the ring 1.

For the sake of simplicity the external ribs and marks on the side opposite the part 21 of the ring, and the thickened part 1a shown in FIG. 3, have not been shown in FIG. 11.

As previously pointed out, the cap may have either a diametral groove 25 or a groove 25a shown in phantom lines, in alignment with the two scorings 13 shown on FIG. 11. Regardless of its exact position, such a groove facilitates removal of the cap and its tearing along certain of the scorings.

The grooves 25 and 25a, the webs 15 and the portion 21 of the ring 1 which is connected to the cap 3 are found in FIG. 12 as well.

It will be appreciated that the foregoing embodiments have been described purely by way of example and they may be modified as to detail without thereby departing from the basic principles of the invention.

In particular, only two instead of four scorings 13 may be provided, and these may be oriented toward the side of the cap to which the ring is secured.

What is claimed is:

1. One-piece plastic bottle cap comprising inner and outer skirts depending from a circular top and an external reinforcing ring secured to said cap, encircling said outer skirt, and adapted to be used as means for removing said cap, said plastic cap being characterized by the fact that it comprises retaining means on the inside of said outer skirt, [said retaining means having a maximum radial dimension attained along only part of the inner wall of said outer skirt], that said cap has external dimensions approximating those of a conventional crown cap, that said reinforcing ring is integrally connected to the lower part of said cap over a sector of at least nearly 60° on one side of said cap and by at least one frangible web on the opposite side of said cap.

2. Cap as claimed in claim 1 which is scored along lines at spaced intervals about its peripheral wall so as to tear along those lines when removed from a bottle, said points being visible when said reinforcing ring is in place on said cap.

6

3. Cap as claimed in claim 2 in which said scored lines are in alignment with spaces which separate said retaining means into arcuate segments.

4. Cap as claimed in claim 1 having an external mark above said reinforcing ring opposite its integral 60° connection to said cap.

5. Cap as claimed in claim 1 comprising a central depression in the top thereof which prevents radial expansion of the cap during pasteurization and is adapted to receive the index finger of a user when the cap is being removed.

6. Cap as claimed in claim 1 in which said reinforcing collar comprises a radially projecting protuberance on the side opposite its integral 60° connection to said cap.

7. Cap as claimed in claim 1 which comprises a roughened portion on the side opposite the 60° integral connection of said ring to said cap.

8. Cap as claimed in claim 1 in which said ring is connected to said cap by two frangible webs symmetrically positioned opposite the 60° integral connection of said ring to said cap.

9. Cap as claimed in claim 1 in which the lower surface of said ring is provided, near its 60° connection to said cap, with a groove adapted to be engaged by a conventional bottle opener.

10. Cap as claimed in claim 1 in which said retaining means has a scalloped edge and is divided into segments by four circumferentially equidistant notches.

11. Cap as claimed in claim 1 in which said retaining means comprises two semi-circular members symmetrically positioned with respect to a diametral plane perpendicular to the plane of symmetry of the cap and separated by short circumferential openings.

12. Cap as claimed in claim 11 in which said openings extend into the peripheral wall of the cap to form weakened points for initiating tears in said cap when it is removed from the bottle.

13. Cap as claimed in claim 1 in which said retaining means comprises one flange extending over a sector of about 120° opposite the integral connection of said ring to said cap, and two symmetrically positioned flanges occupying sectors of about 60° each and spaced about 60° from each other.

14. Cap as claimed in claim 1 in which said reinforcing ring is thicker on the side opposite its 60° connection to the cap and is provided with a boss on its upper part.

15. Cap as claimed in claim 14 in which said boss extends upwardly to the top of the cap proper.

16. Cap as claimed in claim 15 which comprises a seal extending across said boss and the top of said cap.

17. Cap as claimed in claim 1 in which said sealing skirt comprises an inner wall and a thicker outer wall radially spaced therefrom.

18. Cap as claimed in claim 17 in which said outer wall is provided with an external rib positioned to seat against the inside of a bottle's neck.

19. Cap as claimed in claim 1 comprising a compressible sealing ring between its peripheral wall and said sealing skirt, said sealing ring being made of a plastisol containing sufficient plasticizer to bring the melting point of the material of which the sealing ring is made below that of the material of which the cap proper is made.

20. Cap as claimed in claim 19 in which said compressible sealing ring is made of a plastisol based on a material selected from the group consisting of polyvinyl and polyethylene copolymers.

21. Cap as claimed in claim 19 in which the surface of said cap in contact with said sealing ring is roughened to facilitate adhesion of said sealing ring to said cap.

22. Cap as claimed in claim 2 which is provided with a groove in its upper surface.

23. Cap as claimed in claim 22 in which said groove lies in a diametral plane.

24. Cap as claimed in claim 22 in which said groove is in alignment with two scorings in the peripheral wall



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7

of the cap and lies on the side of said cap opposite its 60° connection to said ring.

25. *Cap as claimed in claim 1 in which said retaining means has a maximum radial dimension attained along only part of the inner wall of said outer skirt.*

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U.S. Cl. X.R.

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# United States Patent

[11] 3,589,543

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[73] Assignee Tamper-Proof Tops Industries Ltd.  
Toronto, Ontario, Canada  
[32] Priority Mar. 23, 1968  
[33] Canada  
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Primary Examiner—George T. Hall  
Attorneys—Arne I. Fors and Frank I. Piper

[54] CONTAINER CLOSURE HAVING FRANGIBLE  
SKIRT PORTION  
8 Claims, 3 Drawing Figs.

[52] U.S. Cl. .... 215/42,  
215/41, 215/100.5, 220/94  
[51] Int. Cl. .... B65d 41/22,  
B65d 41/20  
[50] Field of Search ..... 215/42, 46,  
41, 55, 100.5; 220/27, 54, 94 A

**ABSTRACT:** A tamperproof, safety, plastic cap for containers comprising an end wall and cylindrical skirt adapted to tightly fit onto the neck of a container, and a ring slightly larger than the skirt hinged onto said skirt at one point and joined to the skirt at a plurality of other points by bridges such that the bridges can be ruptured by finger pressure to permit removal of the cap by use of the ring.

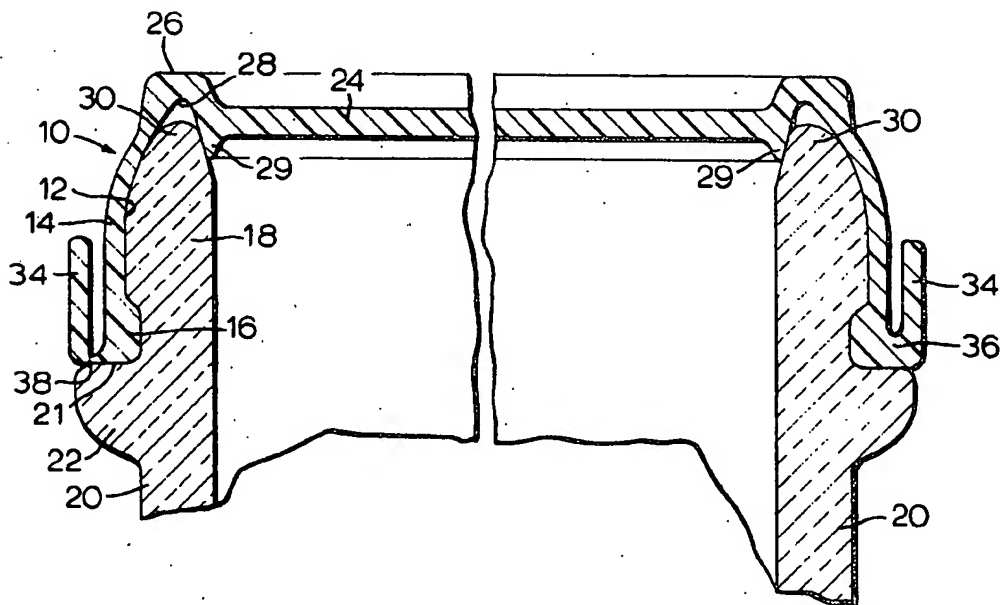


FIG. 1

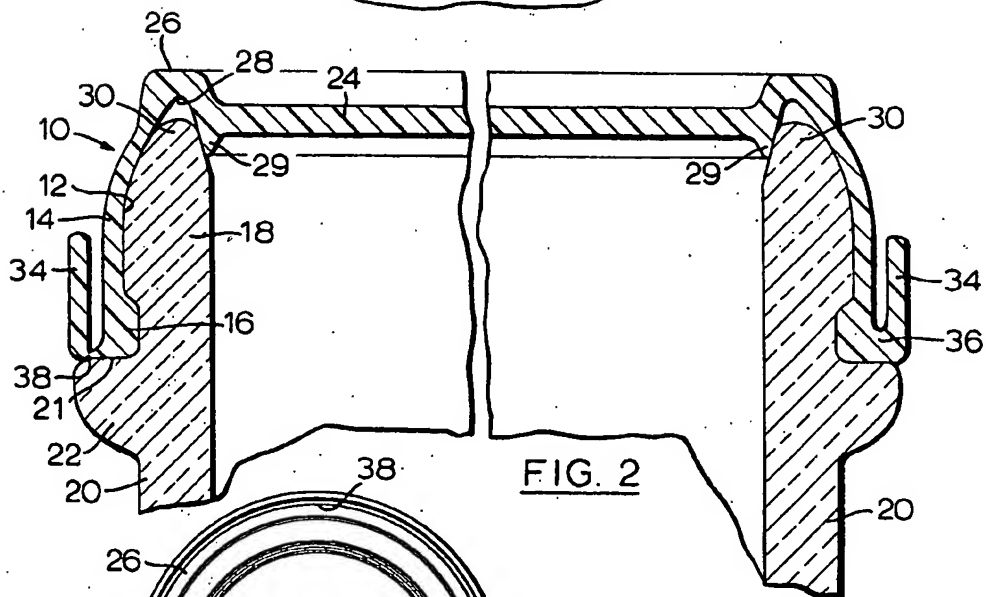
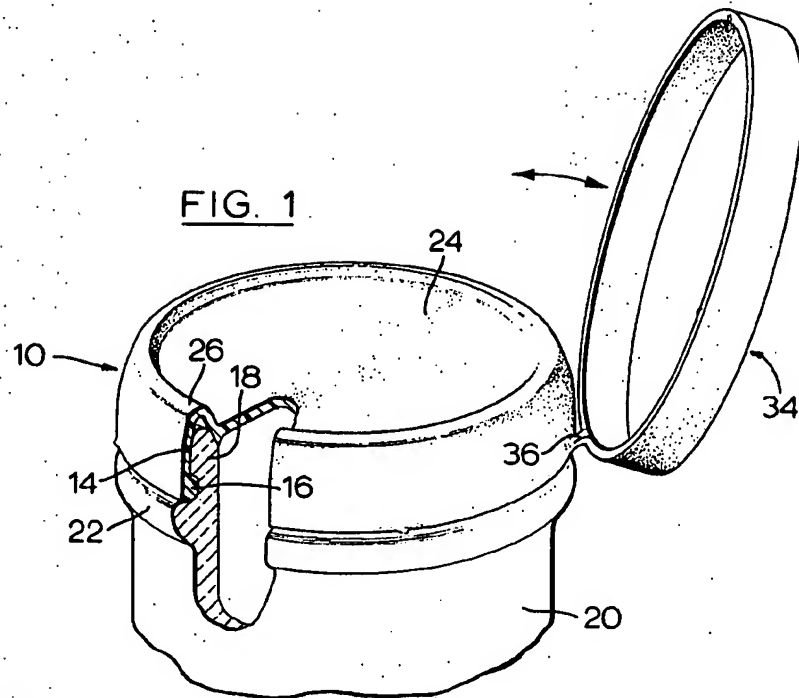


FIG. 2

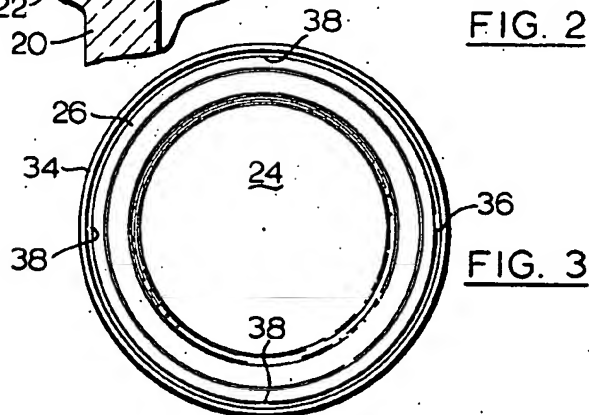


FIG. 3

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## CONTAINER CLOSURE HAVING FRANGIBLE SKIRT PORTION

### BACKGROUND OF THE INVENTION

This invention relates to container closures and is particularly directed to plastic caps for bottles and the like containers.

Bottles having food products offered for sale in supermarkets where the customer is free to handle the goods frequently are opened by customers for inspection of the contents of the bottle. Bottles so inspected have their vapor seals broken and, if not immediately purchased and used by a customer, will deteriorate before eventual use. Also, bottles so inspected are prone to contamination resulting in the generation of bad will towards the processor.

There is a need, therefore, for a container closure which is substantially tamperproof and which will provide indications that the closure has been removed and replaced.

Proprietary medicines and drugs which can be dangerous to the health and well-being of children when consumed in large quantities, and many hazardous and toxic substances are packaged and stored in vials and the like containers which can become accessible to children. The containers often can be opened by children resulting in injury and death. There is also a need, therefore, for a vaportight container closure which foils the efforts of a child to remove the cap in order to gain access to the container's contents.

### SUMMARY OF THE INVENTION

I have discovered a novel container closure which has tamperproof and safety characteristics which substantially overcome the foregoing shortcomings common to many existing container closures. My container closure is a cap made of a material having properties of resiliency and rigidity comparable to that of polypropylene and comprises a cylindrical skirt having an annular concavity on its inner face adapted to receive a convex ridge formed about the neck of a container in tight-fitting relation therewith, a circular end wall integrally joined to an edge of said skirt defining an annular groove at the juncture of the skirt and end wall for receiving the rim of a container therein, a ring having an inside diameter greater than the outside diameter of the skirt, a plurality of bridges formed about the skirt integral with said ring and adapted to be ruptured by finger pressure for securing said ring to the skirt until broken, and hinge means integrally joining said ring to said skirt for pivotal movement of said ring about said skirt.

It is therefore a principal object of the present invention to provide a container closure which is simple in construction and inexpensive to manufacture which can be readily opened by an adult but opened with difficulty by a child.

It is another object of the present invention to provide a container closure adapted for use as a vapor seal and which has tamperproof characteristics for warning purchasers that the closure has been removed and the container vacuum destroyed or the container contents contaminated.

### DESCRIPTION OF THE DRAWINGS

These and other objects of the invention and the manner in which they can be attained will become apparent from the following detailed description of the drawing, in which:

FIG. 1 is a perspective view, partly cut away, of the closure of the invention;

FIG. 2 is an enlarged section taken along the line 2-2 of FIG. 1, partly broken away, showing the engagement of closure with the neck of a bottle, and the relationship of the ring to the closure skirt; and

FIG. 3 is a plan view of the closure.

Like reference characters refer to like parts throughout the description of the drawing.

### DESCRIPTION OF PREFERRED EMBODIMENTS

The container closure of the present invention shown in FIGS. 1-3 comprises a skirt designated by the numeral 10 having a concave annular recess 12 defined by thin-walled skirt section 14 and a relatively thick portion 16 adapted to receive the neck 18 of a bottle or the like container 20 in tight-fitting engagement. A peripheral shoulder 22 may be formed about the exterior of the neck 18 of the bottle 20 to abut the edge 21 of skirt 10 to obviate the formation of a gap between the bottleneck and skirt to preclude a child prying the skirt from the bottleneck. Circular end wall 24 is joined to the opposite edge of skirt 10 at 26 and an annular groove 28 formed at the bight of the juncture of end wall 24 and skirt 10, together with annular rib 29, are adapted to receive the rim 30 of bottleneck 18 such that a slight space is defined between the cap and the bottle edge for reasons which will become apparent as the description proceeds.

A ring 34 having an inside diameter greater than the outside diameter of skirt 10 is joined to the exterior of skirt 10 by a hinge 36 formed integral with said skirt and ring for pivotal movement of the ring about the skirt, as indicated by the arrow in FIG. 1. A plurality of bridges 38 formed integral with skirt 10 and ring 34 equispaced about the closure, as indicated most clearly in FIG. 3, are adapted to be easily ruptured by finger pressure such that the ring 34 can be readily pivoted from its normal position concentric with skirt 10 to an upright position substantially perpendicular to end wall 24 allowing the consumer to insert a finger in the ring and pull the closure from the bottleneck.

The container closure is formed of a plastic such as polypropylene to tolerances which permits the tight application of the closure to the neck of a bottle such that the skirt 10 makes a tight fit with the neck necessitating the exertion of about 16 pounds pressure on ring 34 in a direction substantially perpendicular to the plane of wall 24 for removal of the closure from the bottle. The maximum pressure that can be exerted by an average child of five years of age and under is less than 16 pounds and, thus, the container closure normally cannot be opened by a small child.

The closure can be readily manufactured by injection moulding to the tolerance desired. Polypropylene and the like plastics are desirable in that the closure has sufficient resiliency and strength for recapping and reuse by the consumer while providing adequate rigidity to ensure an effective vapor seal is provided and the necessary forces must be applied to remove the closure from the bottle.

In use, food products such as baby foods are placed in sterilized containers at elevated temperatures, closures automatically applied, and subsequent cooling of the contents of the container provides a partial vacuum therein. Skirt 10 and rib 29 tightly grip the neck of the container with the partial vacuum in annular groove 28 assisting the formation of a vapor seal. When it is desired to open the container, bridges 38 are ruptured by an upward pressure on ring 34 such that the ring will pivot about axis 36 to a position substantially perpendicular to the plane of end wall 24. An upward pressure on ring 34 in a direction away from bottle 20 results in the closure being pried loose from the bottleneck.

The present invention provides a number of important advantages. The closure is substantially pilferproof and warns potential purchasers and consumers that the container has been opened. The closure also permits the safe storage of proprietary medicines, drugs and other hazardous substances.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. A container closure formed of a material having properties of resiliency and rigidity comparable to that of polypropylene and which comprises a cylindrical skirt having an annular concavity on its inner face adapted to receive a convex ridge formed about the neck of a container in tight-fitting abutting relation therewith, a circular end wall integrally joined to an edge of said skirt defining an annular

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groove at the juncture of the skirt and end wall for receiving the rim of a container therein whereby an annular closed space is defined between the container rim and closure, a ring having an inside diameter greater than the outside diameter of the skirt, a plurality of bridges formed about the skirt integral with said ring and adapted to be ruptured by finger pressure for securing said ring to the skirt until broken, and hinge means integrally joining said ring to said skirt for pivotal movement of said ring about said skirt.

2. In a container closure as claimed in claim 1, a peripheral shoulder formed about the container neck adjacent the edge of the skirt for preventing forcible removal of the closure.

3. In a container closure as claimed in claim 1, an annular ridge formed adjacent the annular groove at the juncture of the skirt and end wall for abutment with the inner surface of the rim of a container.

4. A closure of a material having properties of resilience and rigidity comparable to that of polypropylene for a container opening comprising: a skirt and an end wall formed integral with said skirt adapted to receive the container neck therein in tight-fitting abutting relation, an annular groove formed in proximity to the juncture of the skirt and end wall for receiving the container rim therein whereby an annular closed space is defined between the container rim and closure, an external bead formed on one of said container neck and the inner surface of the skirt and a mating annular groove formed on the

other of the container neck and skirt inner surface for tight-fitting interlocking engagement of the bead in the groove, a ring formed concentric with and about said skirt having at least one frangible bridge interconnecting said ring to said skirt, and a hinge joining said ring to said skirt permitting pivotal movement of the ring about the skirt upon rupture of said frangible bridge, whereby said closure can be removed from the container by a pull of predetermined force on the said ring.

5. In a container closure as claimed in claim 4, a peripheral shoulder formed about the container neck adjacent the edge of the skirt for preventing forcible removal of the closure.

6. In a container closure as claimed in claim 4, an annular ridge formed adjacent the annular groove at the juncture of the skirt and end wall for abutment with the inner surface of the rim of the container.

7. A container closure as claimed in claim 4, in which the container rim defines with the annular groove by abutment therewith the annular space which, under a partial vacuum therein, enhances the formation of a vapor seal between the closure and container opening.

8. A container closure as claimed in claim 7, in which said skirt grips the container neck sufficiently tightly to require about a 16-pound pull on the ring to pry the closure loose from the container.

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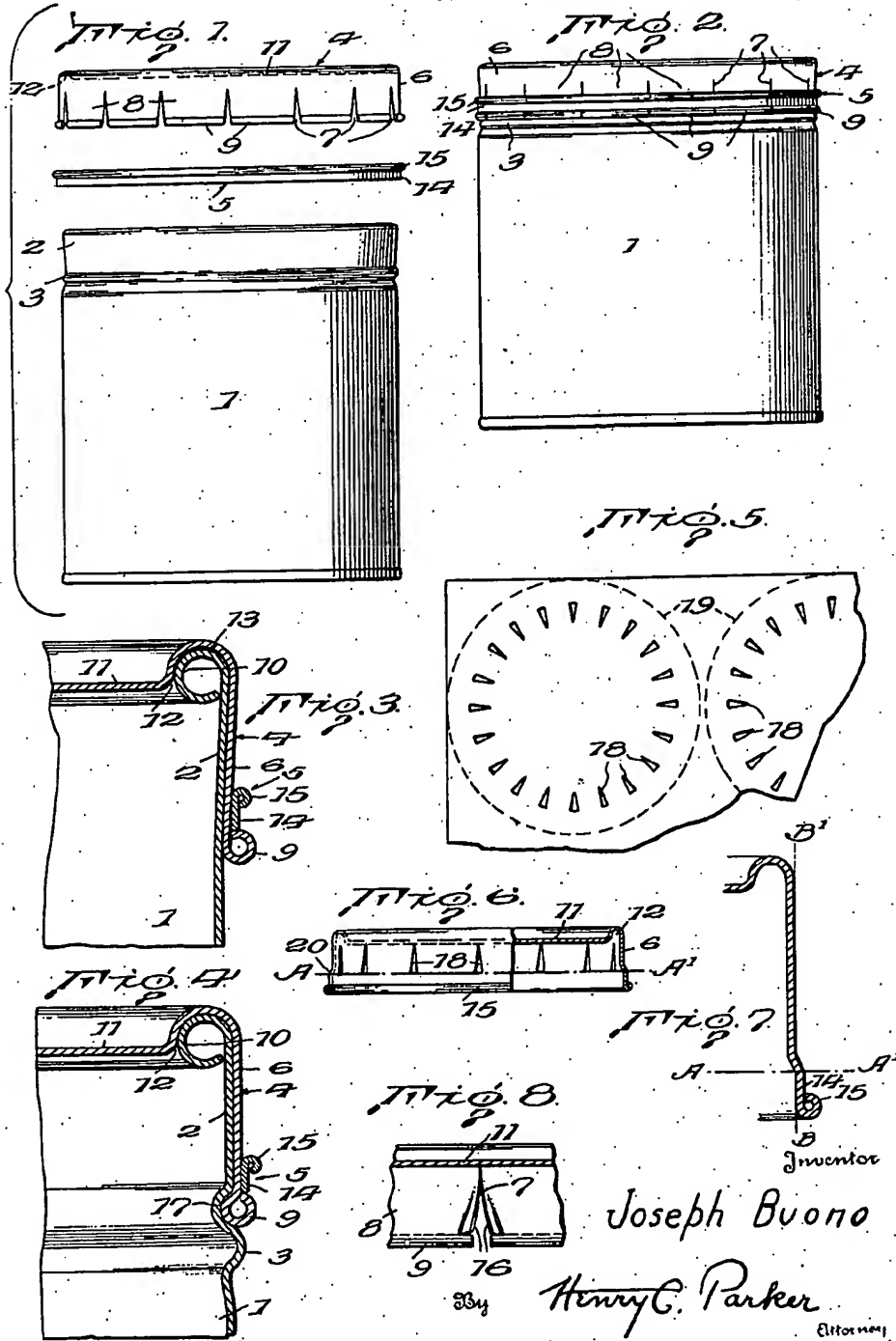
**Jan. 9, 1940.**

**J. BUONO**

**2,186,518**

**CLOSURE FOR CONTAINERS**

Filed April 21, 1937



## UNITED STATES PATENT OFFICE

2,186,518

## CLOSURE FOR CONTAINERS

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12 Claims. (Cl. 220-61)

This invention relates to closures for containers; these closures being particularly adapted for use with flexible walled containers having lips which are slightly flared and usually provided with a curled or rounded edge. My closures comprise a cover part or cap, having a top which may be paneled and a depending peripheral flange or skirt which is advantageously slit to form a plurality of resilient tongues curled at their ends, and a cooperating ring adapted to fit snugly over said depending skirt and to compress said skirt tightly against the neck wall of the container to form a frictional contact therewith. The ring advantageously has a skirt portion and a curled portion, the skirt serving to space said curled portion from the curls of said tongues and the curled portion cooperating with said curls to provide a convenient means for separating said closure from said container; all as more fully hereinafter set forth and as claimed.

While innumerable closures have been suggested in the prior art for use with glass and other substantially non-flexible containers, the number which have been developed for use with metal and other flexible walled containers is much smaller. The recent development of containers made from artificial plastics, all of which possess considerable flexibility, has greatly increased the demand for the latter type of closure. Closures of the so-called friction type, that is, closures which rely substantially upon friction for retention, are particularly adapted for use with flexible walled containers but very few of these friction type closures are available.

The requisites of a satisfactory closure include ease of application, ease of removal, the production of a tight seal, which is usually required to be hermetic, and fool-proofness. It is also desirable that the closures be capable of removal without damaging them in order that they may be employed thereafter as temporary closures. By far the most of the closures which have been proposed heretofore have been lacking in one or more of these particulars. To my knowledge none of the friction type closures which have been proposed possess all of these characteristics.

I have developed a closure of the friction type, which is particularly applicable to containers having resilient neck walls and lips, which is readily applied and removed without damage, which is capable of producing a hermetic seal and which is substantially proof against accidental removal. This closure is made in two parts. The cover or cap can be made with a flat top if desired but if the container is provided with a rounded lip I prefer to provide a paneled or dished top having a peripheral recess for reception of said rounded lip. The cap is provided with a depending skirt or flange which is usually slit in such manner as to provide a

plurality of depending resilient tongues which normally embrace the neck of the container closely. The ends of these resilient tongues are curled or rolled over. The cap may be made slightly smaller than the top of the container so that, when applied, it slightly compresses the container lip and neck walls.

The second part of my closure consists of a ring which is adapted to fit over the resilient tongues of the cap compressing them tightly against the neck of the container. The ring is provided with a depending skirt, which is adapted to seat against the curls of the cover and with an upper curled or rolled edge, the skirt portion serving to space the rolled edge of the ring from the curls of the cover. This spacing provides sufficient room for the insertion of a coin or other implement between the rolled edge of the ring and the curls of the cover. And when the ring is thus pried away from its seat or removed from the cover, the depending tongues of the cover are released and the cover becomes easily removable. The closure can then be removed without damage. It forms a highly satisfactory temporary closure either with or without the use of the ring. If both cover and ring are employed, a tight friction closure results whereas, if the ring is discarded, the cover acts as a slip cover. The lip and neck walls of my container can be made straight if desired but it is advantageous to slightly flare or taper this portion of the container in order to provide additional friction tending to prevent accidental removal of the closure. When the neck and/or lip portion of the container is flared, these parts are compressed to some extent upon application of the closure. It is thus evident that my closure is particularly applicable to containers having resilient neck and lip walls since the resiliency of these parts is an important factor in retaining the closure on the container. When the containers are provided with flared necks and lips it is therefore advantageous that these parts be resilient.

My closure is retained in position essentially by means of the high friction between closure and container. The major part of this friction arises from the close contact between the skirt of the cover and the neck wall of the container, this being increased by any flaring of the neck wall. An appreciable amount of friction also occurs between the rounded lip of the container and the cover recess into which it fits. On account of these frictional contacts it is extremely difficult to remove my closure without initially releasing or removing the ring. And the ring is protected from accidental displacement by the curls on the depending tongues of the cover. My closure can be made sufficiently tight even

to retain oil or other penetrating fluids and is capable of holding a vacuum.

While the cover and ring of my closures can be applied separately, I have found it advantageous to apply the closure with the ring in its seated position. The containers are thus closed and sealed in one operation. The lip and neck walls of the container are compressed to some extent during application of the closure and the closure expands slightly. Since these parts are resilient they tend to return to their original shape after being applied. In the modification wherein the cap is provided with a recessed top the recess tends to force the container lip back into its normal position upon seating of the closure.

My invention can be explained with greater accuracy by reference to the accompanying drawing which illustrates several embodiments of my invention. In this showing:

Fig. 1 is an elevation of a container showing the cap and ring parts of the closure removed;

Fig. 2 is a similar view of the same container with closure applied,

Fig. 3 is an enlarged vertical section through the neck and lip of a container showing a closure applied thereto,

Fig. 4 is a similar sectional view of a modification showing my closure applied to a container having a straight neck and lip,

Fig. 5 is a plan view of a sheet of metal showing the results of the first punching operation employed in the making of my closures,

Fig. 6 is an elevation, partly in section, of the closure blanks after being cut out and drawn in the second operation employed in making my closures,

Fig. 7 is an enlarged view in vertical section of the edge of the closure blank showing how the blank is cut to separate the ring from the cap in the next step of making my closures, while

Fig. 8 shows a modified form of slit cap which can be employed in my invention.

In the various figures like elements are represented by like reference numerals. The container to which my closures are applied is shown generally at 1. This is usually provided with a slightly flared neck portion 2 above a bead 3, the circumference of the neck just above the bead being slightly smaller than that at the mouth of the container, as shown in Fig. 1. The bead 3 may be omitted, if desired, as shown in Fig. 3 and the neck portion can be made straight as shown in Fig. 4. This neck portion, when flared, should be made of resilient material such as metal or one of the artificial plastics, such as phenol-formaldehyde or aurea-formaldehyde plastic, for example. If made of metal the lip edge of the container is advantageously curled as shown at 10 in Figs. 3 and 4.

The closure is made in two parts, a cover or cap shown generally at 4 and a ring, shown generally at 5. The cover is provided with a depending skirt 6 in which slits 7 are usually formed leaving depending tongues 8. The latter are rolled or curled at their ends, forming curls 9. If desired the tongues 8 may be partly rolled or bent at their lateral edges, as shown at 16 in Fig. 8. These curls 16 may be turned either inwardly or outwardly. The cover may have a flat top or it may be provided with a depressed panel portion as shown at 11 leaving a peripheral inner recess 12 for reception of the bead 10. The bead 10 should fit the recess 12 closely making a tight joint at this point. If desired this joint

may be provided with a rubber or other packing element 13, as shown in Fig. 3. For example, a thin coating of a rubber cement may be applied to the recess 12 which, after drying, forms a highly satisfactory packing gland capable of producing a hermetic seal. The cover is generally made of the same general contour as the top portion of the container over which it fits. This provides a snug fit between cover and container over their entire area of contact.

The ring 5 is provided with a depending skirt 14 and its upper edge is rolled over at 15. Its inner diameter may be made slightly smaller than the outside diameter of the cap in order that the ring may tend to compress the resilient tongues of the cap. In other embodiments, however, these diameters may be made substantially equal. The skirt 14 of the ring serves to space the rolled edge 15 from the curls 9 and a coin may be inserted in this space in order to pry the ring upwardly or to remove it, thereby releasing the tongues 7 and making the cap easily removable. When the lateral, partially rolled edges 16 of the tongues 8 are turned inwardly, as shown in Fig. 8, they tend to key into the surface of the container thus locking the closure tightly on the container until released by sliding the ring upwardly above the curled edges of the tongues.

When a container with a straight neck wall is employed, as shown in Fig. 4, it is not necessary that the container be made of resilient material. Glass can be used, for example. When the wall of this container is of sufficient thickness its lip may be rounded to fit the recess 12, the curl 10 being omitted. It is also possible to omit the slits in the skirt of the cover which is used in this modification. The closure can be forced on over the container mouth owing to its own elasticity. In this case however it is desirable to provide an additional means for locking the closure in position and insuring against its accidental removal. Such an additional means is shown in Fig. 4. In this modification a recess 17 is provided in the container wall in position to receive the curls 9 of the cap. In this modification the curls 9 are shaped in such manner as to fit into the recess 17, as shown in Fig. 4. When the ring is applied the curls lock into the recess and effectually prevent accidental removal of the closure.

Figs. 5, 6 and 7 illustrate an advantageous method of making my closures from a sheet of metal. In this method the caps and rings are cut out and shaped in one piece. In the first operation a circle of triangular cut-outs 18 is made, as shown in Fig. 5 usually by means of a punching operation. If desired several of these circles of cut-outs may be punched at the same time. The next step is a drawing or stamping operation in which the closure blanks are cut out, along the dotted lines 19 shown in Fig. 5, and simultaneously the closure blanks are drawn into the form shown in Fig. 6. The metal which eventually forms the ring is that just below the cut-outs. It will be noted that, owing to the drawing operation, the cut-outs are reduced in width forming slits. It will be noted also that, during the drawing operation, the lower edge of the blank is rolled over, thereby forming the rolled edge 15 of the ring and that the section of the blank wall below the cut-outs is expanded in size, as shown at 20 in Fig. 6, thus forming the skirt 14 of the ring. In the next step the ring is cut from the cap. This cutting operation can take place along the line B-B' or A-A' or along any angle between these two lines. The cutting



takes place at a point on a line with the lower edges of the cut-outs hence the cutting operation changes the cut-outs into the slits in the skirt of the cap. In the final step of my process the lower edges of the tongues 8 are rolled to form the curls 9 and the closure is completed. Cutting and rolling may be accomplished advantageously during the same stamping, spinning or die forming operation. When made in this manner my closures are accurately dimensioned and exactly reproducible. The process is very simple and inexpensive.

While I have described what I consider to be the best embodiments of my closure and process of making the same it is obvious that several modifications can be made without departing from the scope of the present invention. It is possible, for example, to vary the process outlined above to a considerable extent. Thus in the first step the cut-outs may be formed and the blanks cut along the dotted lines 19 simultaneously. The tops of the blanks may be first stamped flat and later embossed to form the inner recess 12. It is also possible to cut the ring from the cap before the rolled edge 15 is formed. However, the steps which have been outlined previously are believed to represent the best and cheapest method of forming my closures.

The skirt of my cap can be varied in length depending upon the amount of friction desired. The dimensions of the ring may also be varied considerably. The recess 17 for receiving the curls 9 may be provided, as an added element to prevent accidental removal of the closure, even when the neck and lip walls of the container are flared. Other modifications which fall within the scope of the following claims will be immediately evident to those skilled in the art.

What I claim is:

1. In combination, a container having resilient lip and neck walls and a resilient, friction-type closure having a depending peripheral flange with a curled margin adapted to fit tightly over said neck wall and to conform thereto, and a tightly fitting ring adapted to fit over said closure and to compress said depending flange tightly against said neck wall to make a friction-type seal therewith, said ring having a curled portion spaced from the curl of said depending flange, when said ring is in its seated position, a sufficient distance to permit entry of an implement therebetween, thereby permitting removal of said closure without destruction of said ring.

2. The combination of claim 1 wherein the inner diameter of said closure and the outer diameter of said ring are so related that the lip and neck walls of the container are compressed and the closure is expanded slightly upon application of said closure, the said lip and neck walls, the said closure and the said ring being sufficiently resilient to permit application of the closure on the container while the ring is in its seated position on said closure.

3. The combination of claim 1 wherein said depending flange terminates in a plurality of tongues rolled at their ends and wherein said ring is adapted to seat over said tongues.

4. The combination of claim 1 wherein said depending flange terminates in a plurality of tongues rolled at their ends and partially rolled at their edges and said ring is adapted to seat over said tongues.

5. The combination of claim 1 wherein said ring is provided with a depending skirt for sepa-

rating its rolled edge from the rolled edge of the depending flange of said cover.

6. In combination, a container having slightly flared resilient lip and neck walls and a resilient, friction-type closure having a depending peripheral flange terminating in a plurality of depending tongues with rolled ends adapted to fit tightly over said lip and neck walls and to conform thereto, and a ring adapted to fit over said depending tongues and to compress said tongues tightly against said neck wall, said ring having a rolled edge spaced from the rolled ends of said tongues, when in its seated position, a distance sufficient to permit entry of a coin for displacement of said ring from its seated position thereby releasing the pressure on said tongues and permitting removal of said closure without destruction of said ring.

7. In combination, a container having resilient lip and neck walls with a recess in its neck wall, and a resilient, friction-type closure having a depending peripheral flange terminating in a plurality of depending tongues with rolled ends and adapted to fit tightly over said lip and neck walls, and a ring adapted to fit snugly over said depending tongues and to seat said rolled ends in said recess, said ring being provided with a rolled edge cooperating with the rolled ends of said tongues to provide means for removing said closure from said container without destruction of said ring.

8. The combination of claim 7 wherein said ring is provided with a skirt portion adapted to space its rolled edge from the rolled ends of said tongues.

9. The combination of a container, having a substantially straight neck wall and a rounded lip, with a friction-type closure of resilient material provided with an inner recess adapted to receive said curled lip, said closure comprising a depending skirt portion having a marginal curl, and a ring with a curled portion adapted to seat over said depending skirt thereby compressing said skirt against the neck wall of the container, the curl of said skirt and the curled portion of said ring being spaced sufficiently to provide room for the insertion of an instrument for unseating said ring.

10. The combination of claim 9 wherein said container is of metal and said rounded lip is curled.

11. The combination of claim 1 wherein said depending flange terminates in a plurality of tongues rolled at their ends and partially rolled inwardly at their edges and said ring is adapted to seat over the edges of said tongues thereby keying said edges into the wall of said container.

12. In combination, a container having slightly-flared resilient lip and neck walls and a resilient, friction-type closure having a depending peripheral flange with a curled margin adapted to fit tightly over said neck wall and to conform thereto, and a ring provided with a curl adapted to fit over said depending peripheral flange and to compress said flange tightly against said neck wall; the curl of said peripheral flange and the curl of said ring being spaced apart in the seated position of said ring a sufficient distance to permit entry of a coin for displacement of said ring from its seat thereby permitting removal of said closure without destruction of said ring.

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